DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972

by

C. T. Sumsion and others

United States Geological Survey

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INTRODUCTION

This report is the ninth in a series of annual reports that describe ground-water conditions in Utah. Reports in the series are prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources and are designed to provide data for interested parties such as legislators, administrators, and planners to keep abreast of changing ground-water conditions.

This report, like the others (see references, p. 19), contains information on well construction, ground-water withdrawals, water-level changes, and related changes in precipitation and streamflow. It also contains supplementary data that are related to ground-water use in some areas. In reports of this series, the inclusion of such supplementary data as graphs showing chemical quality of water and maps showing water-table configuration is intended only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of the most important areas of ground-water withdrawal in the State for the calendar year 1971. Water-level fluctuations, however, are described for the period spring 1971 to spring 1972. Many of the data used in this report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released by the Geological Survey during 1971:

Geohydrologic sections, Cache Valley, Utah and Idaho, by L. J. McGreevy and L. J. Bjorklund: U.S. Geol. Survey open-file rept.

Ground-water conditions in the East Shore area, Box Elder, Davis, and Weber Counties, Utah, 1960-69, by E. L. Bolke and K. M. Waddell: Utah Dept. Nat. Resources Tech. Pub. 35 (In press).

Ground-water conditions in Utah, spring of 1971, by R. M. Cordova and others: Utah Div. Water Resources Coop. Inv. Rept. 9.

Ground-water hydrology of the San Pitch River drainage basin, Sanpete County, Utah, by G. B. Robinson, Jr.: U.S. Geol. Survey Water-Supply Paper 1896.

Ground-water resources of Cache Valley, Utah and Idaho, by L. J. Bjorklund and L. J. McGreevy: Utah Dept. Nat. Resources Tech. Pub. 36.

Hydrologic reconnaissance of the Blue Creek Valley area, Box Elder County, Utah, by E. L. Bolke and Don Price: Utah Dept. Nat. Resources Tech. Pub. 37 (In press).

Hydrologic reconnaissance of Hansel Valley and northern Rozel Flat, Box Elder County, Utah, by J. W. Hood: Utah Dept. Nat. Resources Tech. Pub. 33.

Hydrologic reconnaissance of the Park Valley area, Box Elder County, Utah, by J. W. Hood: Utah Dept. Nat. Resources Tech. Pub. 30.

Hydrologic reconnaissance of the Promontory Mountains area, Box Elder County, Utah, by J. W. Hood: U.S. Geol. Survey open-file rept.

Nonthermal springs of Utah, by J. C. Mundorff: Utah Geol. and Mineralog. Survey Water Resources Bull. 16.

Summary of water resources of Salt Lake County, Utah, by A. G. Hely, R. W. Mower, and C. A. Harr: Utah Dept. Nat. Resources Tech. Pub. 34.

Water resources investigations in Dinosaur National Monument, Utah-Colorado, fiscal year 1970, by C. T. Sumsion: U.S. Geol. Survey open-file rept.

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UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use, generally can be obtained only in specific areas. These areas of known or potential ground-water development are shown in figure 1 and named in table 1. Only a few wells outside of these areas yield large supplies of water of good chemical quality.

Less than 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows such as basalt, which contains interconnected vesicular openings or fractures; limestone, which contains openings enlarged by solution; and sandstone, which contains interconnected openings between the grains that form the rock. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State, in areas where water supplies cannot be readily obtained from unconsolidated rocks.

More than 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these sizes. Wells obtain the largest yields from the coarser materials that are sorted into deposits of equal grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with debris from the adjacent mountains.

TABLE 1

Areas of known or potential ground-water development in Utah
(locations are shown in fig. 1)

Area	Type of water-bearing rocks
1. Curlew Valley	Unconsolidated
2. Park Valley	Do.
3. Grouse Creek Valley	Do.
4. Hansel Valley	Do.
5. Blue Creek Valley	Do.
6. Sink Valley	Do.
7. Malad-Lower Bear River Valley	Do.
8. Valley east of the Pilot Range	Do.
9. East Shore area, Weber Delta and Bountiful Districts	Do.
10. Jordan Valley	Do.
11. Cache Valley	Do.
12. Bear Lake Valley	Do.
13. Upper Bear River Valley	Do.
14. Ogden Valley	Do.
15. Morgan Valley	Do.
16. Park City area	Do.
17. Kamas Valley	Do.
18. Heber Valley	Do.
19. North flank Uinta Mountains	Do.
20. South flank Uinta Mountains	Do.
21. Uinta Basin	Do.
22. Tooele Valley	Do.
23. Skull Valley	Do.
24. Dugway area	Do.
25. Fish Springs Flat	Do.
26. Sevier Desert	Do.
27. Rush Valley	Do.
28. Cedar Valley	Do.
29. Utah and Goshen Valleys	Do.
30. Juab Valley	Do.
31. Sanpete Valley	Do.
32. Central Sevier Valley	Do.
33. Upper Sevier Valleys	Do.
34. Deep Creek Valley	Do.
35. White Valley	Do.
36. Snake Valley	Do.
37. Pine Valley	Do.
38. Wah Wah Valley	Do.
39. Escalante Valley, Beryl-Enterprise District	Do.
40. Escalante Valley, Milford District	Do.
41. Beaver Valley	Do.
42. Cedar City Valley	Do.
43. Parowan Valley	Do.
44. Upper Fremont Valley	Do.
45. Lower Fremont Valley	Consolidated
46. Spanish Valley	Unconsolidated
47. Castle Valley (Grand County)	Do.
48. Montezuma Creek area	Consolidated
49. Kanab area	Unconsolidated
50. St. George area	Do.
51. Pavant Valley	Do.
52. Colton area	Consolidated
53. Scipio area	Do.
54. Lisbon Valley	Do.
55. Monticello area	Do.
56. Blanding area	Do.
57. Bluff area	Do.

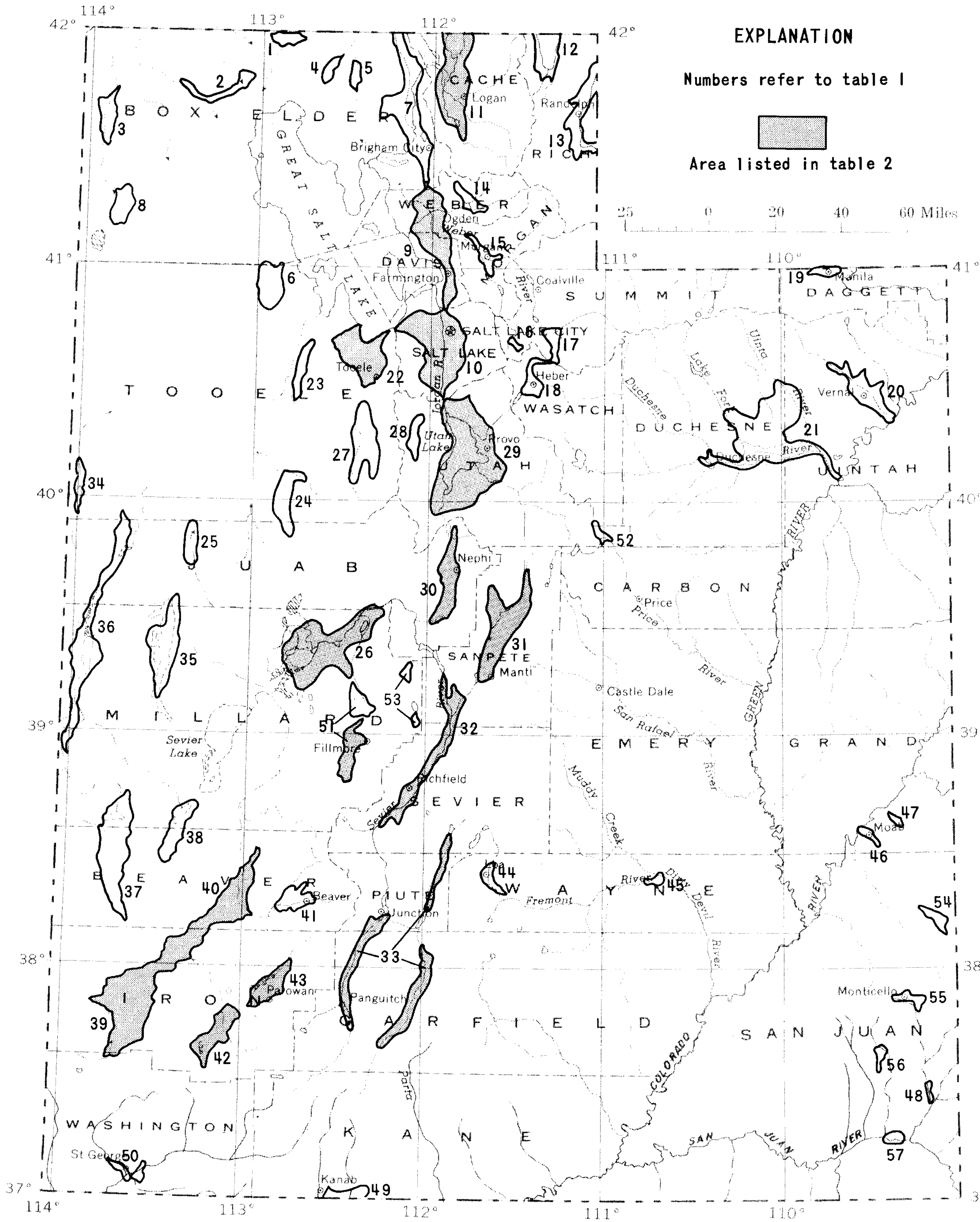

Figure 1.—Map of Utah showing areas of known or potential ground-water development.

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah in 1971 was 710,000 acre-feet, or about 30,000 acre-feet more than was reported for 1970 (Cordova and others, 1971, p. 7). The most significant change was an increase in withdrawal for irrigation of 28,000 acre-feet. This was mainly the result of decreased streamflow available for irrigation in some areas and an increase in the number of new irrigation wells put into use in 1971 in other areas.

In 1971 precipitation was above normal in six of the State's seven divisions (National Oceanic and Atmospheric Administration, 1972). Precipitation in the north-central division was 3.58 inches above normal and 0.29 inch above normal in the south-central division; these two divisions include most of the major areas of ground-water development in the State. The south-east division suffered a deficiency of 0.30 inch during 1971. From February-March 1971 to February-March 1972, ground-water levels generally declined in southwestern Utah because more ground water was withdrawn for irrigation, and rose in northern Utah where more surface water was available for irrigation. Conditions in the central part of the State were variable, and no consistent pattern of water-level change is evident.

The larger ground-water basins and those containing most of the ground-water developments in Utah are shown in figure 1 and are listed in table 2, together with information about the number of wells constructed and the withdrawal of water from wells during 1971. The discussions that follow summarize ground-water development and changes in ground-water conditions in the major areas of ground-water development.

Table 2.—Well construction and withdrawal of water from wells in 1971 in major areas of ground-water development in Utah.

Area	Number in figure 1	Number of wells completed 1/: Diameter: Less than 6 inches 2/	Number of wells completed 1/: Diameter: 6 inches or more 2/	Number of wells completed 1/: New large-withdrawal wells 3/	Withdrawal from wells (acre-feet): Irrigation	Withdrawal from wells (acre-feet): Industry	Withdrawal from wells (acre-feet): Public supply	Withdrawal from wells (acre-feet): Domestic and stock	Withdrawal from wells (acre-feet): Total (rounded)
Cache Valley	11	13	8	2	11,600	7,000	2,800	2,100	23,500
East Shore area, Weber Delta and Bountiful districts	9	21	10	4	4/17,700	6,500	16,400	-	40,600
Jordan Valley	10	19	10	2	4,400	38,600	39,200	5/33,800	116,000
Tooele Valley	22	0	14	1	4/20,400	800	2,700	100	24,000
Utah and Goshen Valleys	29	15	32	4	53,900	6,100	13,500	12,700	86,200
Juab Valley	30	0	3	2	20,900	50	0	150	21,100
Sevier Desert	26	12	7	1	13,700	600	1,500	1,300	17,100
Sanpete Valley	31	10	4	1	12,100	400	500	6/3,100	16,100
Upper and central Sevier Valleys	32,33	11	6	2	11,600	100	1,500	6,100	19,300
Pavant Valley	51	0	9	6	78,200	100	150	300	78,800
Cedar City Valley	42	0	9	11	1/34,200	1/500	1/800	1/150	1/35,700
Parowan Valley	43	0	6	12	1,7/23,500	1/300	1/100	1/150	1/24,100
Escalante Valley									
Milford district	40	0	2	0	56,500	300	600	600	58,000
Beryl-Enterprise district	39	0	10	18	1/74,200	1/0	1/100	1/600	1/74,900
Other areas		18	115	33	8/62,200	8/2,400	8/9,100	8/1,000	8/74,700
Totals (rounded)		119	245	99	495,000	64,000	89,000	62,000	710,000

1/ Data from Utah Department of Natural Resources, Division of Water Rights.
2/ Includes replacement wells.
3/ New wells (6 inches or more in diameter) constructed for irrigation, industrial, or public supply.
4/ Includes some domestic and stock use.
5/ Includes some use for fish and fur culture and air conditioning.
6/ Includes some use for irrigation.
7/ Includes some use for stock.
8/ Estimated minimum amount.

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CACHE VALLEY

by L. J. Bjorklund and L. J. McGreevy

The withdrawal of water from pumped and flowing wells during 1971 was about 23,500 acre-feet as compared to 24,800 acre-feet in 1970 (Cordova and others, 1971, p. 8) and 25,600 acre-feet in 1969 (Sumsion and others, 1970, p. 10). The principal reason for lesser withdrawal in 1971 was the greater availability of surface water for irrigation.

Ground-water levels in Cache Valley rose during the period March 1971 to March 1972 (fig. 2). A rise of more than 2 feet occurred in the principal aquifer underlying the area near Logan. The general rise of water levels was the result of above-average precipitation during 1971 (fig. 3) and the consequent increase of streamflow and available irrigation water and decrease of withdrawal from wells.

The long-term trend of the water level in well (A-12-1)29cab-1, near Logan, the annual discharge of the Logan River near Logan, and the cumulative departure from the 1931-60 normal annual precipitation are shown in figure 3 for comparison. The rise of water level in well (A-12-1)29cab-1 reflects the general trend throughout Cache Valley. Annual discharge in the Logan River in 1971 was the largest since 1912. The high discharge resulted from above-normal precipitation during 1971.

EAST SHORE AREA, WEBER DELTA AND BOUNTIFUL DISTRICTS

by E. L. Bolke

The withdrawal of water from wells in the East Shore area in 1971 was about 40,600 acre-feet, or 1,600 acre-feet more than that reported for 1970 (Cordova and others, 1971, p. 9).

Water levels rose in most of the East Shore area from March 1971 to March 1972 (fig. 4). The greatest rises occurred south of Willard and east of Kaysville. The greatest decline occurred in a small area near Hill Air Force Base.

The long-term relation between precipitation and water levels in wells is illustrated in figure 5. The rise of water levels in wells in the East Shore area is attributed to above-average precipitation. Withdrawals for public supply and industry increased slightly from the previous year.

JORDAN VALLEY

by R. W. Mower

The withdrawal from wells in Jordan Valley in 1971 was 116,000 acre-feet, an increase of 7,400 acre-feet or about 7 percent over that in 1970. (The total reported for 1970 (Cordova and others, 1971, p. 10) should have been 108,500 acre-feet and that reported for public supply should have been 33,500 acre-feet.) The largest increase in withdrawals was for public supply which used 39,200 acre-feet, due to a larger population served (fig. 6) and to above-normal temperatures during the summer of 1971 which resulted in more lawn watering than during 1970. Although the mean annual temperature recorded during 1971 at the Salt Lake City WSFO (International Airport) station was 0.5°F (0.3°C) less than normal, the mean annual temperature recorded for the three summer months was 0.7°F (0.4°C) greater than normal. The withdrawal for irrigation was about 40 percent more than in 1970 due to increased use on lands not irrigated with surface water.

Water levels rose from February or March 1971 to February 1972 in about 90 percent of Jordan Valley (fig. 7) and declined in about 10 percent; the net average change in the valley was a rise of 0.75 foot. The maximum observed rise was slightly more than 2 feet in three small areas, in northern Salt Lake City, about 3 miles east of Sandy City, and near Lark. The maximum observed decline was slightly more than 2 feet about 2 miles southeast of Lark. The maximum rises occurred in areas where the average annual recharge from above-normal precipitation is potentially greatest. The declines were due to increased pumping for public supply and industrial uses in areas of relatively small recharge.

The long-term relations between fluctuations of precipitation and water levels are illustrated in figure 8. Precipitation at Silver Lake Brighton during 1971 was 6.22 inches above normal, and this increase is shown by the continued steep rise in the precipitation graph. The above-normal precipitation and only moderately increased withdrawals in most parts of the valley are reflected by a slight rise of water levels in four of the five wells. The decline in well (D-1-1)7abd-6 represents the local effect of increased withdrawals for public supply.

TOOELE VALLEY

by L. R. Herbert

The withdrawal of 24,000 acre-feet of water from wells in Tooele Valley in 1971 was about 800 acre-feet less than reported for 1970 (Cordova and others, 1971, p. 11). The decrease resulted mainly from lesser amounts of water used for irrigation.

The discharge from springs in 1971 was approximately 13,700 acre-feet, an increase of 300 acre-feet over the previous year. Of this amount, about 2,200 acre-feet was used for irrigation and stock in the valley, and about 11,500 acre-feet was diverted to Jordan Valley for industrial use.

Water levels rose in most of Tooele Valley from March 1971 to March 1972 (fig. 9), due to above-normal precipitation, less water being pumped locally, and increased availability of surface water for irrigation in 1971. The areas where declines occurred were the result of residual effects of heavy local pumping.

The long-term relation between water levels in selected wells and precipitation at Tooele is shown in figure 10. The precipitation in 1971 was 2.75 inches more than the 1931-60 normal, and as a result, water levels rose in five of the seven selected wells. Declines which occurred in areas influenced by local pumping are shown by water levels in the other two selected wells.

UTAH AND GOSHEN VALLEYS

by L. L. Miller

Withdrawals of water from wells in Utah and Goshen Valleys in 1971 totaled about 86,200 acre-feet, which is 3,500 acre-feet more than the withdrawals reported in the previous year (Cordova and others, 1971, p. 12). The increase which was accounted for by 2,100 acre-feet more in Utah Valley and 1,400 acre-feet more in Goshen Valley resulted from greater withdrawals for irrigation and public supply. Withdrawals from wells for industrial use decreased by 700 acre-feet from 1970, and domestic and stock use remained about constant.

From March 1971 to March 1972 ground-water levels in Utah and Goshen Valleys rose in some areas and declined in others (figs. 11-14). Figure 15 shows relations between water levels in three observation wells and the cumulative departure from normal precipitation at Utah Lake Lehi and at Payson. In Utah Valley, ground-water levels declined only in growing metropolitan areas and those areas of heavy withdrawals for irrigation where recharge from precipitation was not enough to compensate for increased water needs. In Goshen Valley, water levels generally declined north of Elberta where irrigation with well water is extensive; but they rose in most of the remainder of the valley.

JUAB VALLEY

by R. G. Butler

The discharge from pumped and flowing wells in Juab Valley during 1971 was about 21,100 acre-feet, an increase of 3,000 acre-feet from that reported for 1970 (Cordova and others, 1971, p. 12). This increase resulted from the increased amount of water pumped from large production wells in the Nephi and Levan areas during the irrigation season.

From March 1971 to March 1972 water levels mostly rose in the northern part of Juab Valley and declined in the southern part (fig. 16). Water levels rose more than 2 feet in an area about 4 miles north of Mona. Water levels declined more than 2 feet in the Nephi area and as much as 1 foot in the Levan area.

The long-term relation between water levels in selected wells and the cumulative departure from the 1931-60 normal annual precipitation in Juab Valley is shown in figure 17. The water level rose in the well in northern Juab Valley in response to above-average precipitation and a decreased amount of ground water pumped for irrigation. The water level declined in the well near Levan although precipitation was above the long-term average, indicating that total discharge locally exceeded recharge.

SEVIER DESERT

by R. W. Mower

The withdrawal of water from wells in the Sevier Desert in 1971 was 17,100 acre-feet, about 2,800 acre-feet more than was reported for 1970 (Cordova and others, 1971, p. 13). Pumpage for irrigation in 1971 increased 20 percent from the amount in 1970 because surface water was less plentiful in 1971. Discharge during the 1971 water year of Sevier River near Juab, the nearest station above all diversions in the Sevier Desert, was 184,400 acre-feet, about 12,500 acre-feet less than during 1970.

Water levels in both the lower and upper artesian aquifers rose from March 1971 to March 1972 in most parts of the Sevier Desert (figs. 18 and 19). The maximum water-level rise in the lower artesian aquifer was slightly more than 2 feet in small areas northwest of Delta and north of Oak City. The maximum rise in the upper artesian aquifer was slightly more than 2 feet in a small area about 4 miles north of Oak City. Maximum water-level declines were less than 1 foot in the lower artesian aquifer southeast of Delta, and slightly more than 1 foot in the upper artesian aquifer in the central part of the area.

During 1971 the precipitation at Oak City was 6 percent above normal and probably resulted in above-normal recharge. This was the seventh year of the past 8 years during which precipitation, and probably recharge, was above normal. Water levels rose in two of the three observation wells for which hydrographs are shown in figure 20, suggesting that the withdrawal from wells in 1971 was less than the recharge in some parts of the Sevier Desert.

SANPETE VALLEY

by R. G. Butler

The withdrawal of water from wells in Sanpete Valley during 1971 was about 16,100 acre-feet, or 1,600 acre-feet more than that reported for 1970 (Cordova and others, 1971, p. 14). This difference was due to an increase in pumpage for irrigation.

Water levels rose in the northern and southern parts of Sanpete Valley from March 1971 to March 1972 and declined in the central part (fig. 21). The greatest declines were in the Mount Pleasant and Ephriam areas where the combined pumpage for irrigation was nearly double the amount pumped the previous year.

Hydrographs of water levels in two pumped irrigation wells and one small-diameter flowing well in Sanpete Valley and the long-term trend of precipitation at Manti are shown in figure 22. Water levels declined in all three wells, reflecting the below-normal precipitation and increased amount of water pumped for irrigation.

THE UPPER AND CENTRAL SEVIER VALLEYS

by C. T. Sumsion

The withdrawal of water from wells in the upper and central Sevier Valleys was about 19,300 acre-feet in 1971, the same as for the previous year (Cordova and others, 1971, p. 14). Water levels rose in nine wells and declined in 19 wells from March 1971 to March 1972 (fig. 23). The greatest rise, 7.79 feet, was in well (C-30-4)35dab-1, south of Circleville, the result of local flooding by an irrigation ditch.

The relation between water levels in selected wells, average annual discharge of the Sevier River at Hatch, and precipitation at Richfield Radio KSVC and Panguitch are shown in figure 24. Although precipitation at Panguitch was again above normal in 1971, the small amount of snow cover in the headwaters area of the Sevier River caused the second lowest discharge on record of the Sevier River at Hatch. Locally, high precipitation resulted in rises of water levels in wells (C-34-5)8adb-2 and (C-21-1)27aad-1. Most other wells in the upper and central Sevier Valleys declined because overall precipitation was deficient during January to March 1972.

PAVANT VALLEY

by D. B. Adams

The withdrawal of ground water in Pavant Valley during 1971 was 78,800 acre-feet, 8,200 acre-feet more than reported for 1970 (Cordova and others, 1971, p. 15). Pumpage for irrigation was more than that reported for 1970 because less surface water was available for irrigation and more wells were put into production.

Water levels rose from March 1971 to March 1972 in about 70 percent of Pavant Valley (fig. 25) and declined in about 30 percent of the valley; the average net increase of water levels was 0.4 foot. In comparison, an average net decline of 0.2 foot was observed from March 1970 to March 1971.

The maximum observed rise from March 1971 to March 1972 was more than 4 feet in the Pavant district. The maximum observed decline was more than 4 feet in the Greenwood district.

The maximum declines in water level were in areas where pumped irrigation wells are concentrated, where additional wells were put in service, or where the amount of pumpage in 1971 was the same or greater than in previous years. Declines of the water table in the Greenwood and McCornick districts have continued for several years. The maximum rises were in areas where pumpage was less in 1971 than in previous years, where irrigation wells are used principally to supplement irrigation supplies from streams, or where the amount of recharge was relatively large. The relation between water levels in selected observation wells and cumulative departure from normal precipitation at Fillmore is shown in figure 26.

Pumpage rates and the quantity of water applied to irrigated fields in Pavant Valley affect the chemical quality of the water withdrawn from wells (Handy, Mower, and Sandberg, 1970, p. D229-D230).

The concentrations of dissolved solids in water from selected wells in the valley are shown in figure 27, and at the three wells sampled in 1972, an increase of concentration was noted from the previous year. The increase at both wells in the Kanosh district correlate with declining water levels in that district. The water level rose in the observation well in the Greenwood district, however, for the first year since 1954; and the increase of dissolved solids from 1970 to 1971 may be a residual effect of the 17 years of declining water levels.

CEDAR CITY VALLEY

by G. W. Sandberg

The withdrawal of water from wells in Cedar City Valley in 1971 was about 35,700 acre-feet, or about 4,300 acre-feet more than was reported for 1970 (Cordova and others, 1971, p. 16). More ground water was pumped for irrigation because of decreased surface-water supplies available from Coal Creek during the irrigation season. Water pumped for other uses remained the same as for 1970.

Water levels declined from 1 to 4 feet throughout most of the valley (fig. 28). Smaller declines occurred in the central, northern, and southern parts of the valley, and a larger decline occurred south of Enoch. Small rises occurred northwest of Enoch and south of Kanarraville.

The relations between water-level fluctuations in well (C-35-11)33aac-1, cumulative departure from normal precipitation near Cedar City, annual discharge of Coal Creek, and annual pumpage for irrigation in the valley are shown in figure 29. Water levels continued to decline as a result of decreased flow in Coal Creek and increased pumping. Heavy local rains during August, October, and December accounted for nearly half of the total annual precipitation recorded at Cedar City; but these rains did not significantly increase the flow of Coal Creek or cause a decrease in the amount of water pumped for irrigation.

PAROWAN VALLEY

by G. W. Sandberg

The withdrawal of water from wells in Parowan Valley was about 24,100 acre-feet in 1971, or about 1,500 acre-feet less than reported for 1970 (Cordova and others, 1971, p. 17). Less water was pumped for irrigation, largely because of increased availability of surface-water supplies. Water pumped for industry (highway construction) increased.

Water levels declined in most of the irrigated area of the valley from March 1971 to March 1972 (fig. 30). The maximum decline was more than 3 feet in the area north and northeast of Parowan. Water levels rose only in small areas south of Little Salt Lake and north of Paragonah.

The long-term relation among changes in water levels, precipitation, and pumpage for irrigation is illustrated in figure 31. The water level in well (C-34-8)5bca-1 rose slightly from March 1971 to March 1972. This was a local condition, however, and not typical of water-level changes in most of the valley. Although precipitation at Parowan in 1971 was above normal, some of it was from heavy local summer rains that did not significantly add to the streamflow available for irrigation.

ESCALANTE VALLEY

by R. W. Mower

Milford district

Withdrawal of water from wells in the Milford district in 1971 was 58,000 acre-feet, the highest of record, and 1,400 acre-feet more than reported for 1970 (Cordova and others, 1971, p. 18).

Water levels declined throughout the district from March 1971 to March 1972 (fig. 32) because of increased pumping and because less surface water was available for irrigation. Streamflow in the Beaver River was 23,020 acre-feet in 1971, or 10,300 acre-feet less than in 1970 (fig. 33). Streamflow diverted for irrigation in 1971 was less than during any year since 1967 and 17 percent less than the 1914-71 average. As a result, recharge to the ground-water reservoir in the areas irrigated with surface water was also less during 1971 than during any year since 1967 and less than the 1914-71 annual average.

The relations between water levels in well (C-29-10)6ddc-2, precipitation at Milford airport, discharge of the Beaver River, and pumpage for irrigation are shown in figure 33. Precipitation at Milford was above normal in 1971. The decline of water levels caused by the increased pumpage and the decreased availability of surface water is represented by the water-level decline in well (C-29-10)6ddc-2 near the middle of the pumped area.

Beryl-Enterprise district

by G. W. Sandberg

The withdrawal of water from wells in the Beryl-Enterprise district in 1971 was about 74,900 acre-feet, an increase of 4,900 acre-feet compared to the amount reported for 1970 (Cordova and others, 1971, p. 18). Pumpage for irrigation increased in 1971 by 4,900 acre-feet, and that for public supply, domestic, and stock uses remained the same as in 1970. Water levels declined throughout the district from March 1971 to March 1972 (fig. 34). The increase for irrigation was probably caused largely by increased output from several large replacement wells (table 2).

The long-term relation between water levels, precipitation, and pumpage for irrigation is shown in figure 35. The graphs show that the water level in well (C-35-17)25dcd-1 has declined steadily since 1945 in response to pumping for irrigation. Most of the decline occurred during a period of below-normal precipitation; however, the overall decline continued during 1967-71 when precipitation was above normal. The rate of water-level decline temporarily diminished during 1969-70 because of local recharge with mine drainage water; however, in 1971 the water level in the well declined once again at the pre-1969 rate.

The concentration of dissolved solids in ground water in the Beryl-Enterprise district has increased as a result of water-level declines caused by pumping for irrigation (Handy, Mower, and Sandberg, 1969, p. D232). Water levels were lowered to the extent that in 1964 a permanent depression in the water table developed (Arnow and others, 1965, p. 91); return seepage from irrigation no longer flows out of the district but is recycled to the fields. The concentration of dissolved solids in water from three wells in the district is shown in figure 36, and the locations of the wells are shown in figure 34. The concentration increased at two of the wells during 1971; and the greatest overall increase was recorded at well (C-36-16)5a-9, which is closest to the center of the depression in the water table. The concentration decreased in well (C-37-17)12bdc-1, about 1 mile northeast of Enterprise, on the edge of the area of depression.

OTHER AREAS

by R. G. Butler

Total withdrawal of water from wells in other parts of Utah during 1971 is not known exactly, but it is estimated to be 74,700 acre-feet. This amount is 2,800 acre-feet more than that reported for 1970 (Cordova and others, 1971, p. 20); and the increase is due, for the most part, to more water being pumped for irrigation.

Water levels rose as a result of above-normal precipitation in the upper Bear River, Bear Lake, Ogden, Morgan, Grouse Creek, and Curlew Valleys, in the Uinta Basin, and in the Monticello and Dugway areas (fig. 37).

Water levels rose in Heber Valley and in the St. George area, although precipitation was below normal (fig. 37).

Water levels declined in Beaver Valley and in the Blanding area, reflecting below-normal precipitation (fig. 37).

Water levels declined in the upper Fremont, Snake, Park, and Cedar Valleys and the south flank of the Uinta Mountains, although precipitation was above normal (fig. 37).

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Sumsion, C. T., and others, 1970, Ground-water conditions in Utah, spring of 1970: Utah Div. Water Resources Coop. Inv. Rept. 8, 71 p.

ILLUSTRATIONS

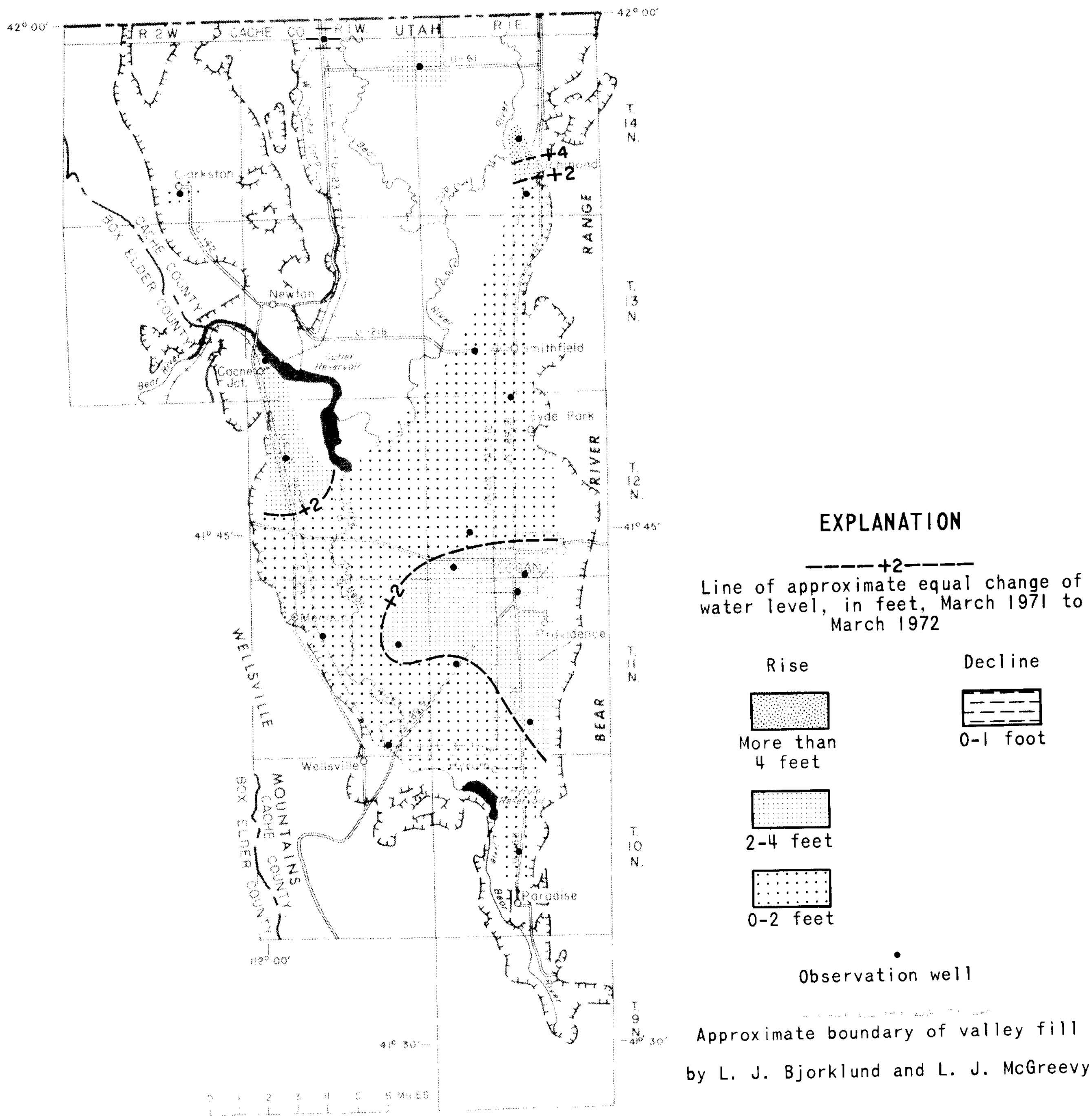


Figure 2.—Map of Cache Valley showing change of water levels from March 1971 to March 1972.

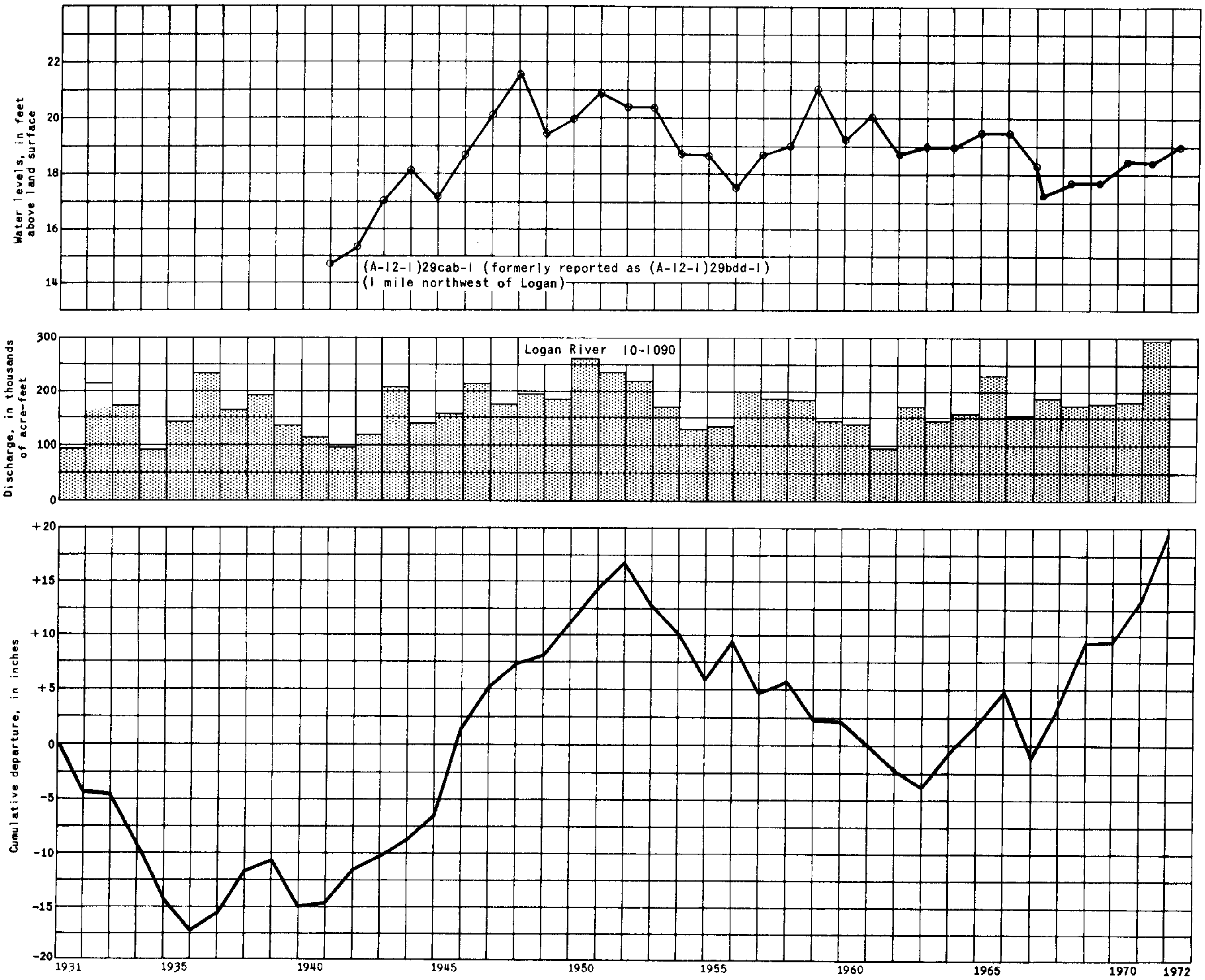


Figure 3.—Relation of water levels in well (A-12-1)29cab-1 to discharge of the Logan River near Logan and to cumulative departure from the 1931-60 normal annual precipitation at Logan Utah State University.

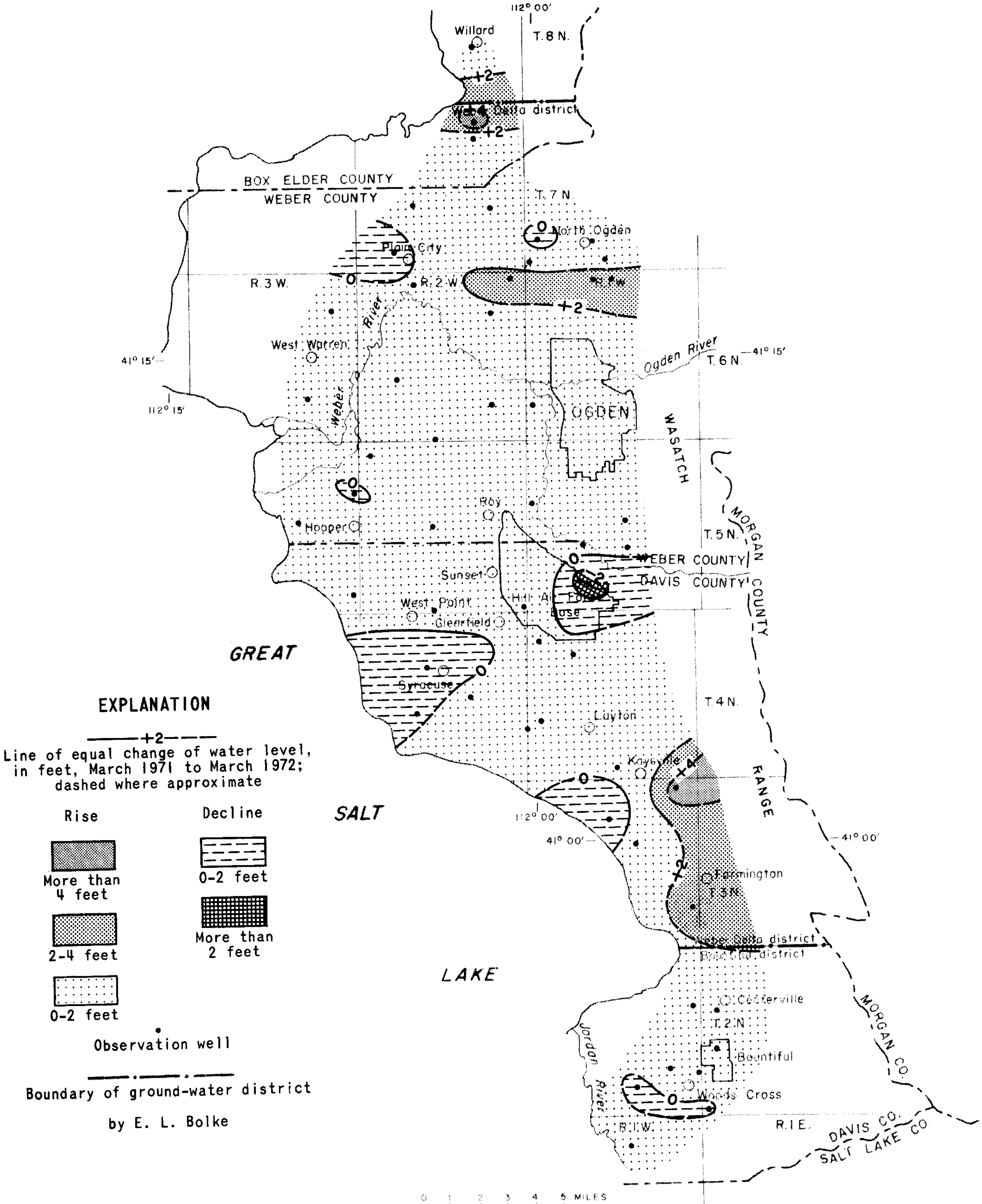


Figure 4.—Map of the East Shore area, Weber Delta and Bountiful districts, showing change of water levels from March 1971 to March 1972.

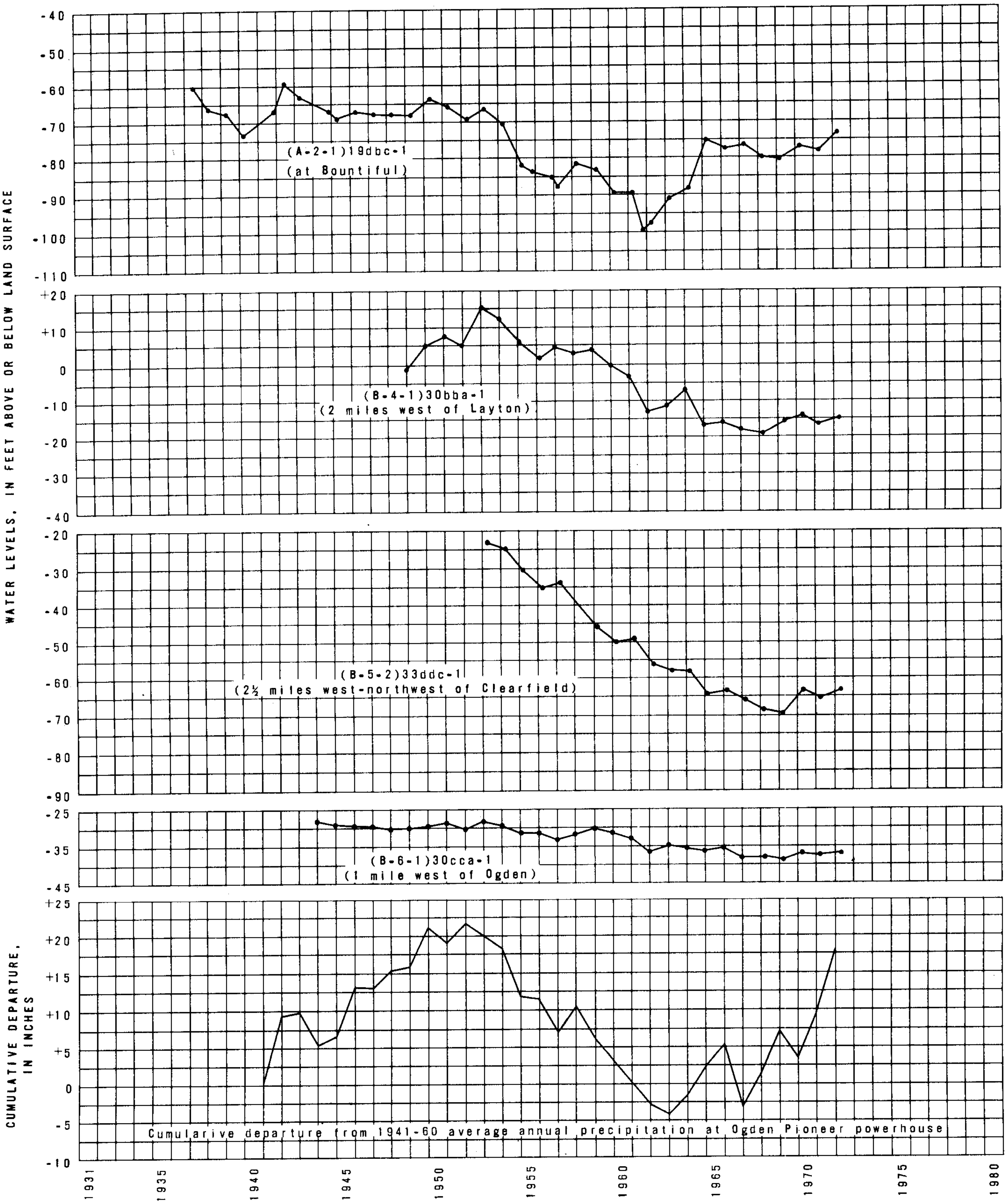


Figure 5.—Relation of water levels in wells near Bountiful, Layton, Clearfield, and Ogden to cumulative departure from the average annual precipitation at Ogden Pioneer powerhouse.

Figure 6.—Graphs showing estimated population of Salt Lake County, water withdrawn from wells, and annual precipitation at Salt Lake City WFSO (International Airport) for the period 1931-71.

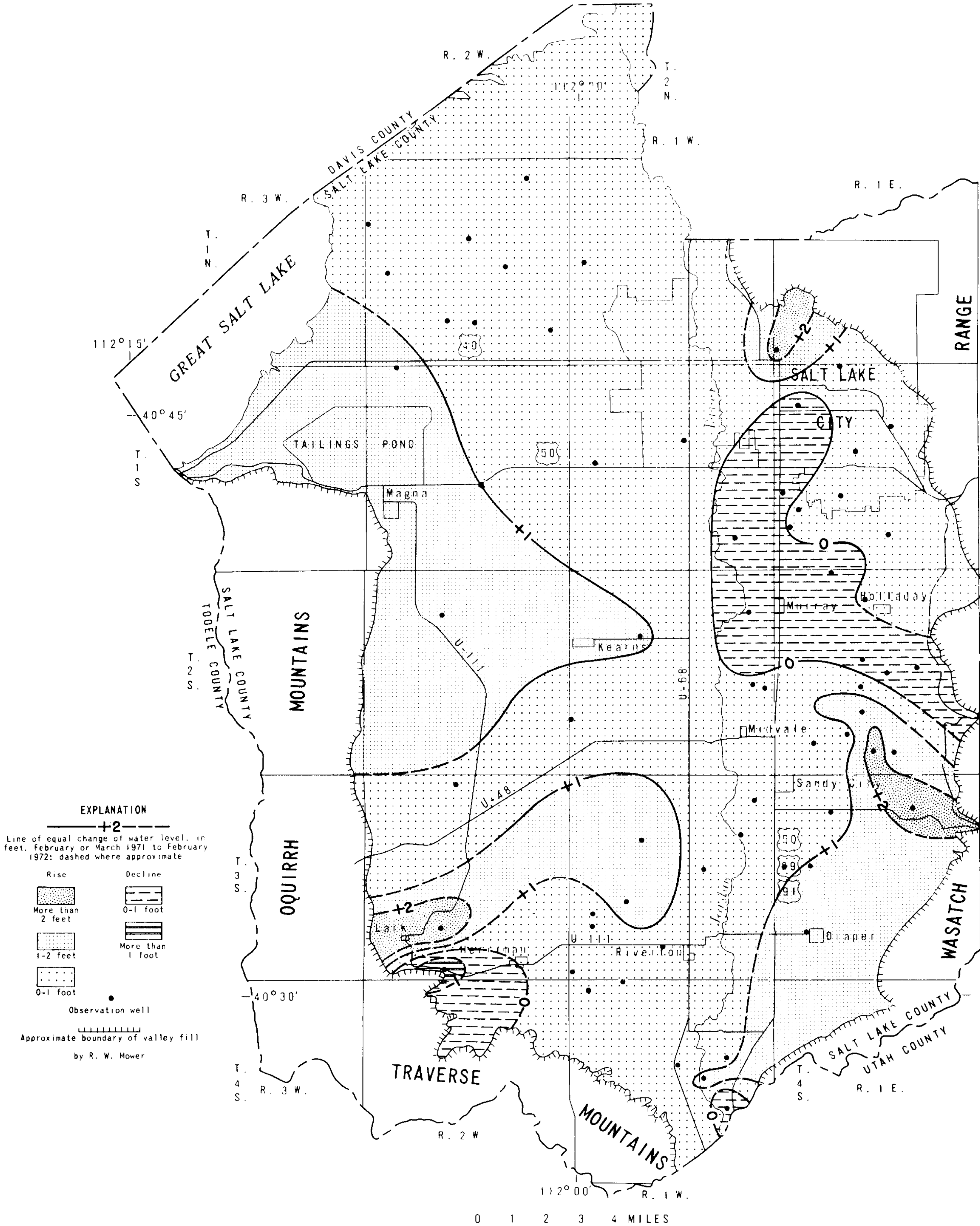


Figure 7.—Map of the Jordan Valley showing change of water levels from February or March 1971 to February 1972.

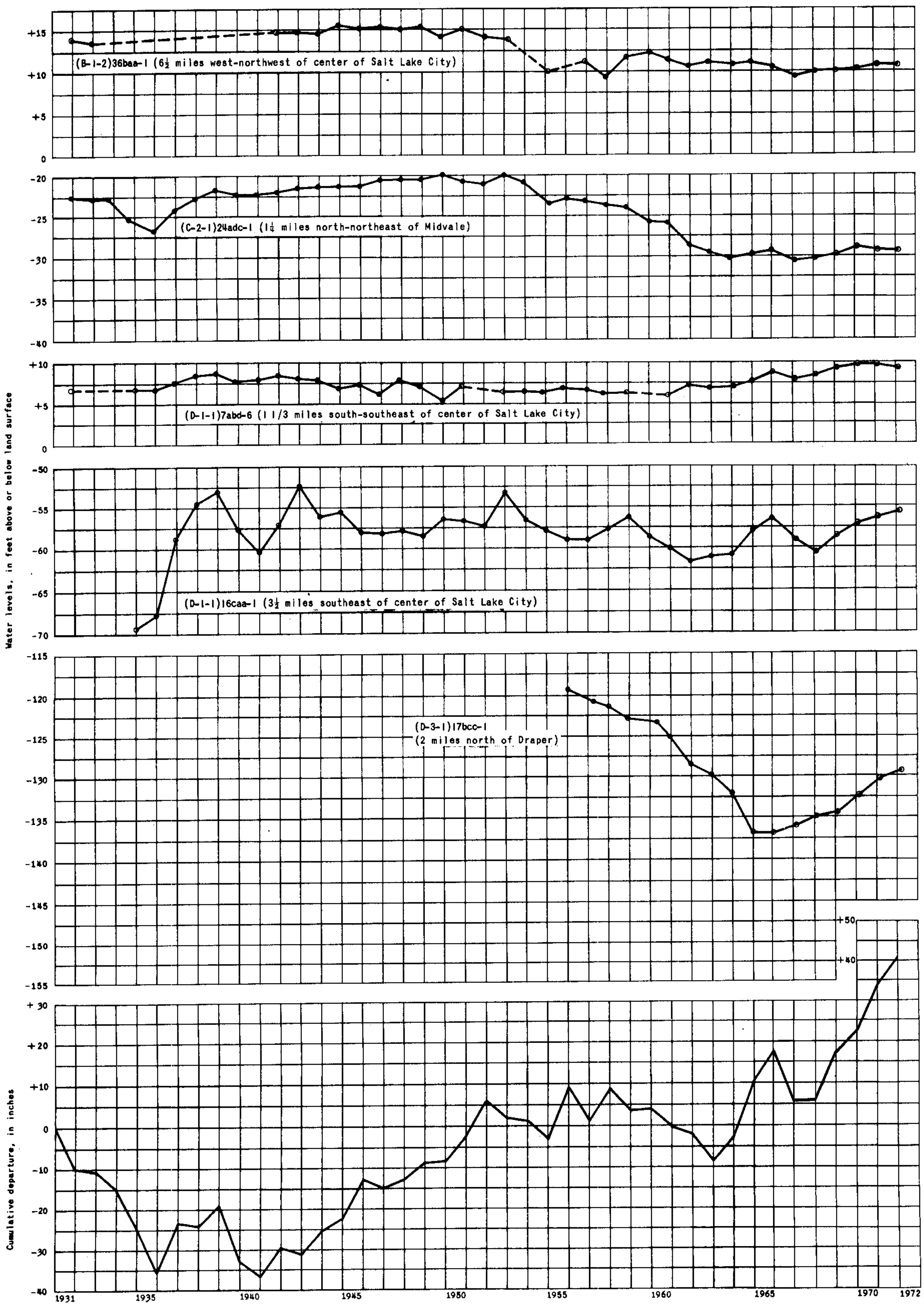


Figure 8.—Relation of water levels in selected wells in the Jordan Valley to cumulative departure from the 1931-60 normal annual precipitation at Silver Lake Brighton.

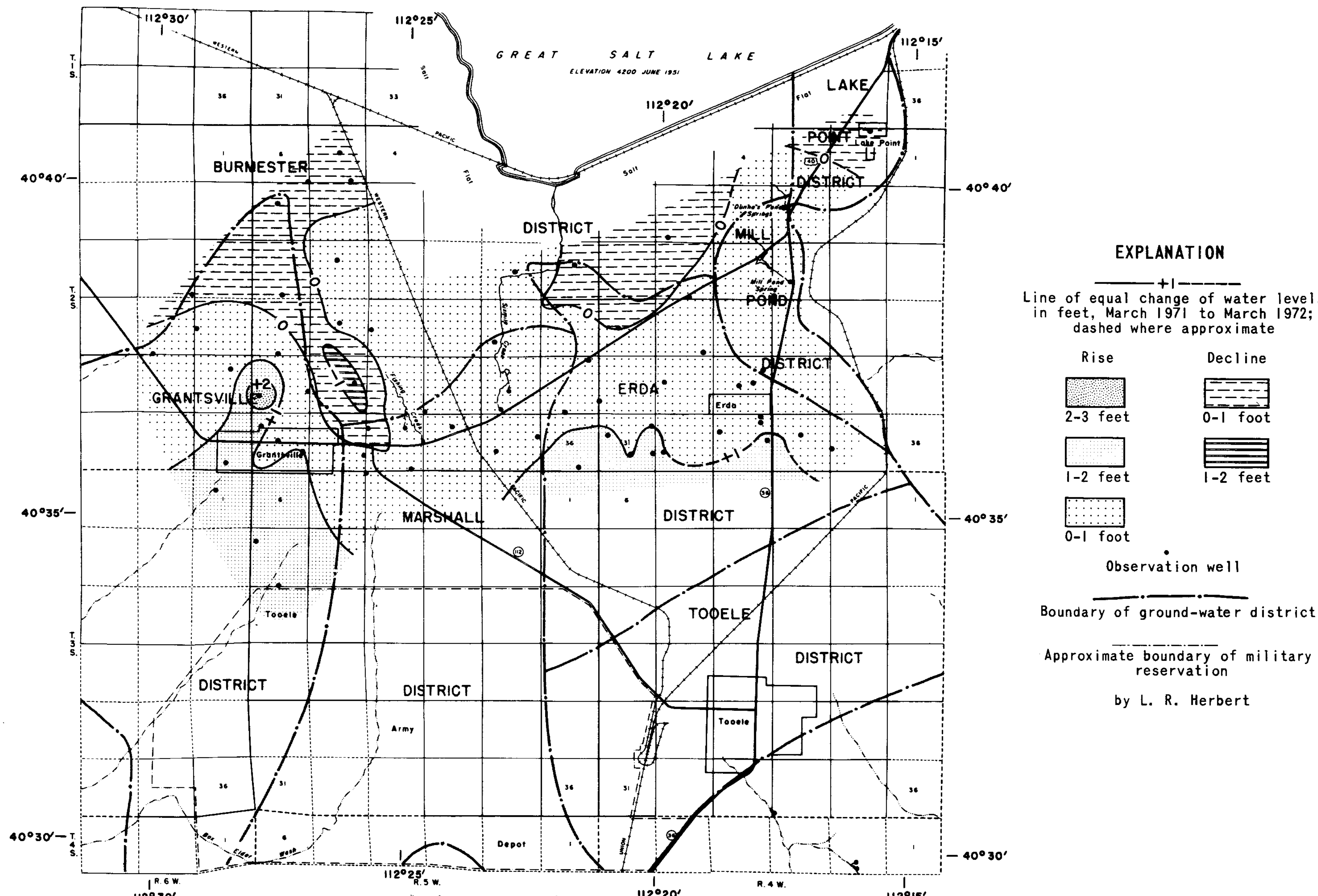


Figure 9.—Map of Tooele Valley showing change of water levels artesian aquifers from March 1971 to March 1972.

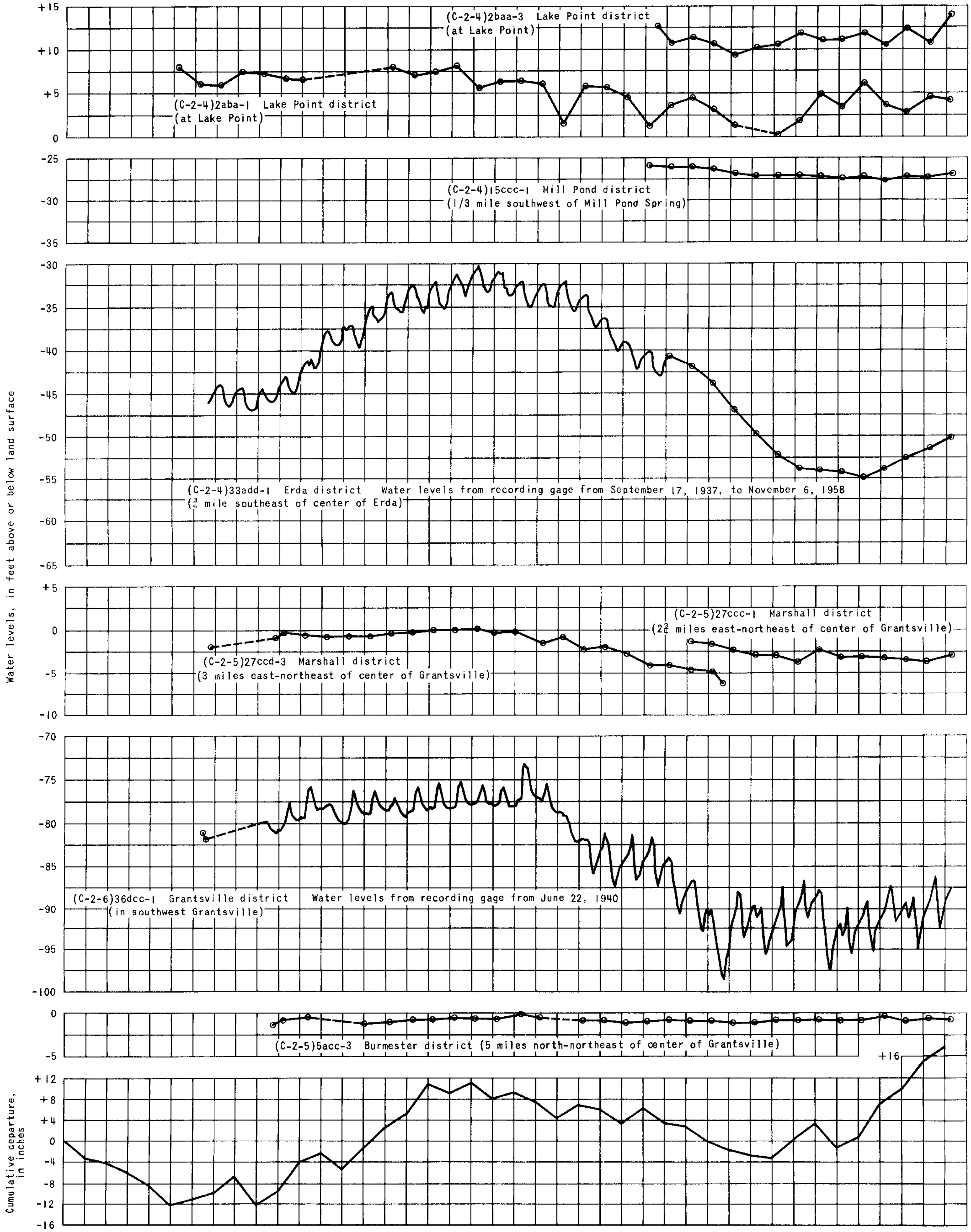
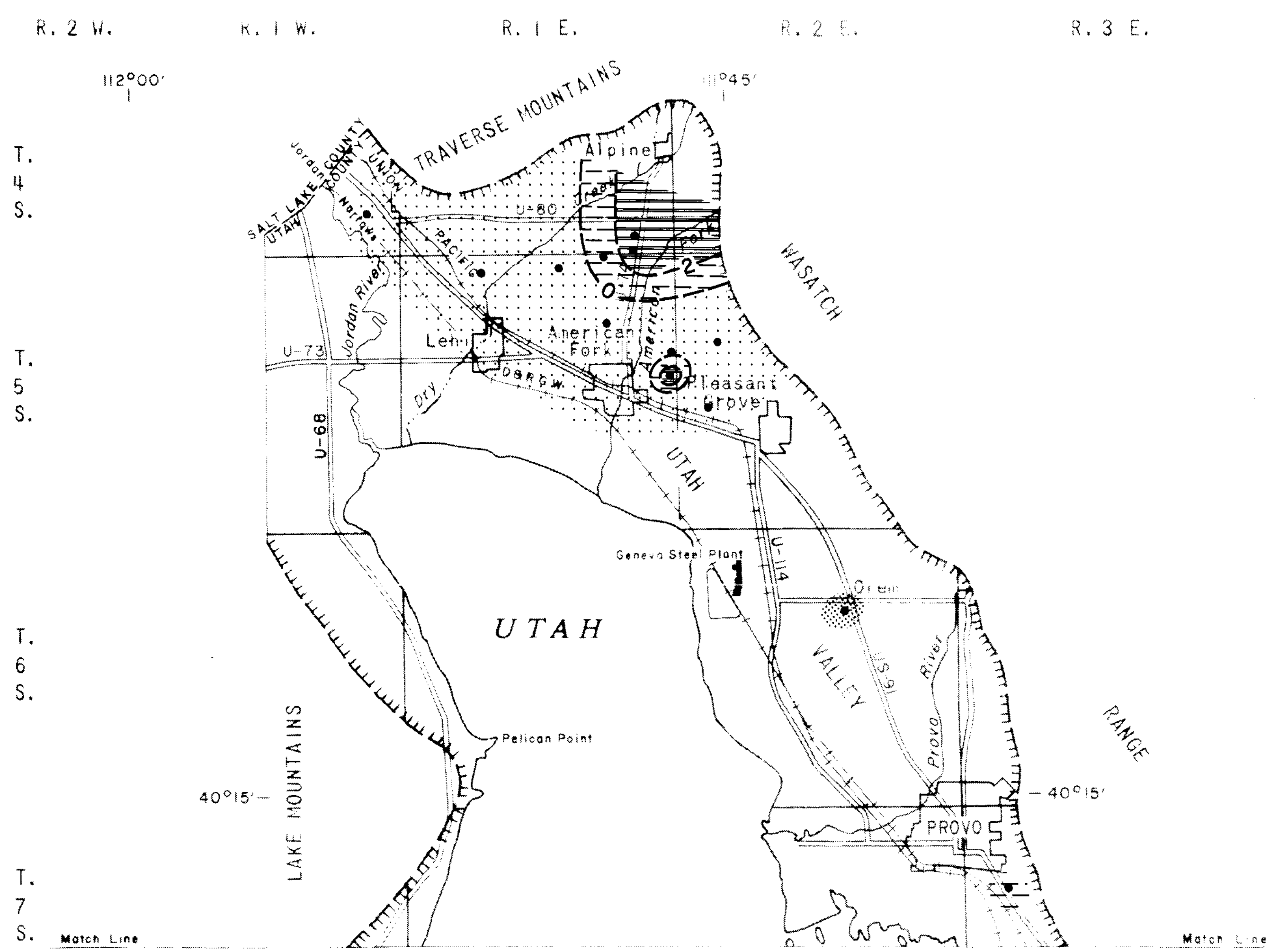


Figure 10.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the 1931-60 normal annual precipitation at Tooele.


R. 2 W.
R. 1 W.
R. 1 E.
R. 2 E.
R. 3 E.
112°00'
111°45'
T. 4 S.
T. 5 S.
T. 6 S.
T. 7 S.
TRAVERSE MOUNTAINS
SALT LAKE COUNTY
UTAH COUNTY
Jordan
Narrows
UNION PACIFIC
U-80
Alpine
Creek
Fork
American
0
2
Jordan River
U-73
Lehi
American Fork
D&RGW
Dry
Pleasant Grove
WASATCH
U-68
UTAH
Geneva Steel Plant
1
U-114
Orem
UTAH
VALLEY
US-91
Provo River
RANGE
Pelican Point
LAKE MOUNTAINS
40°15'
PROVO
Match Line

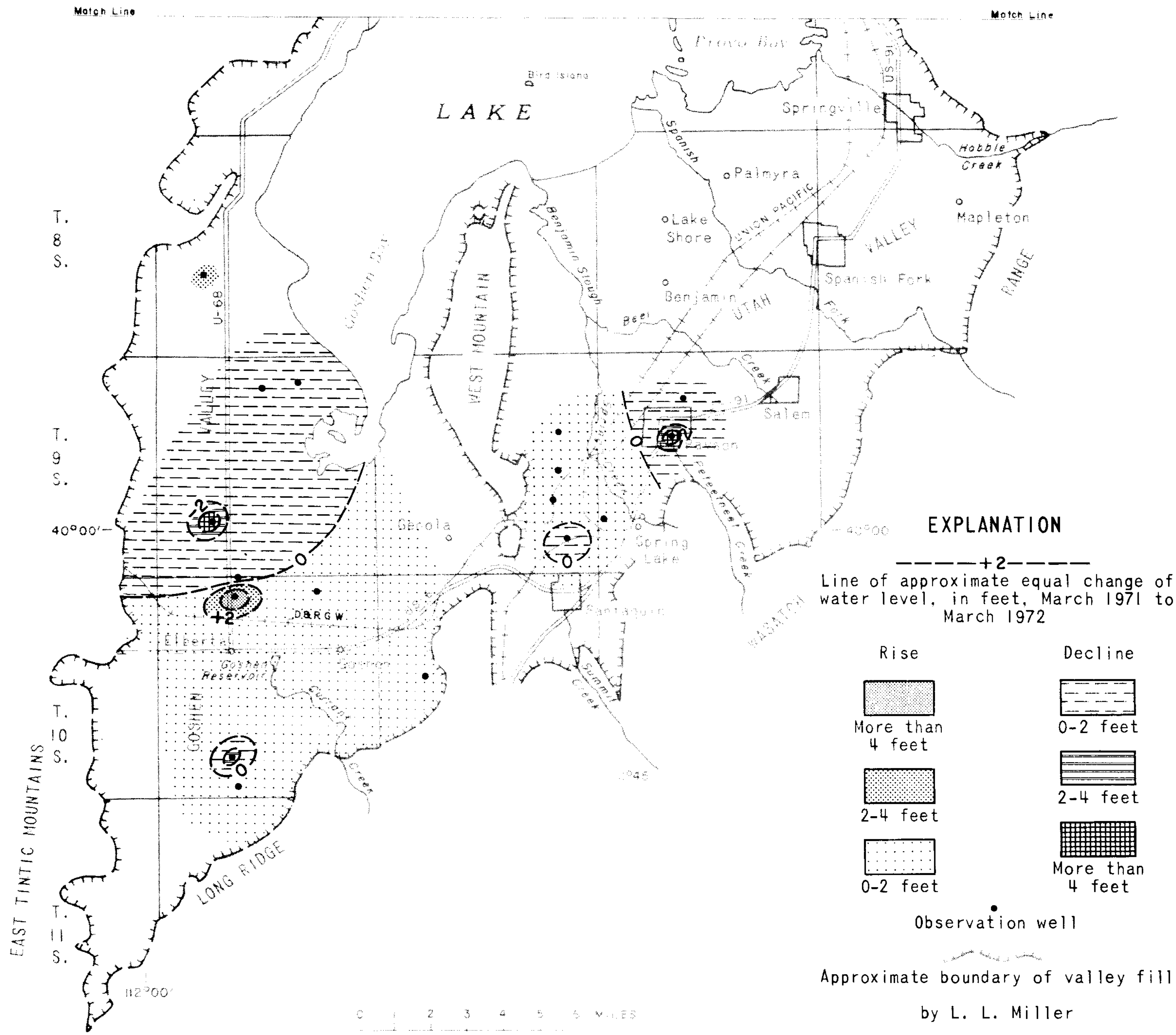
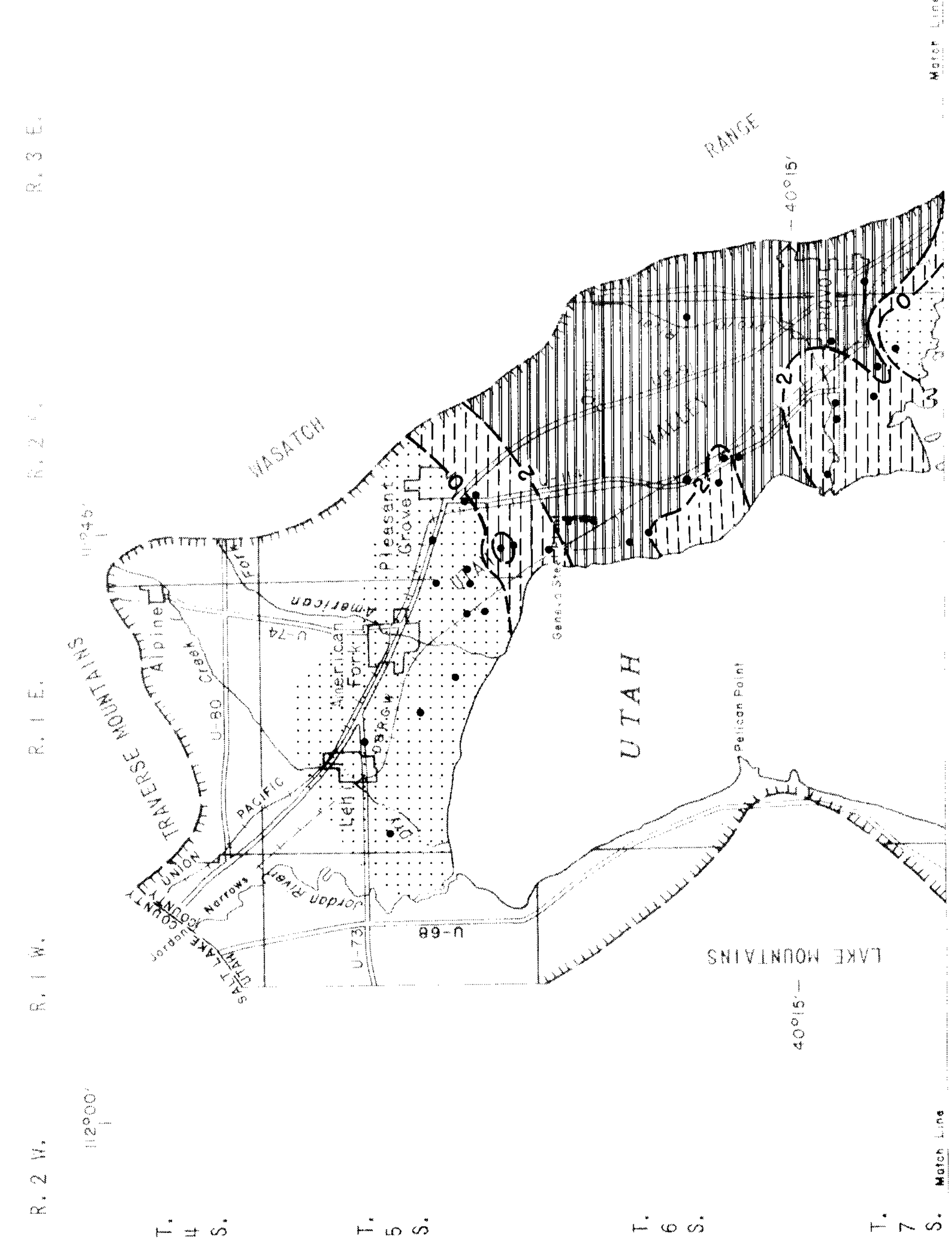


Figure 11.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1971 to March 1972.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R. 1 E.
R. 2 E.
R. 3 E.
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T. 6 S.
T. 7 S.
112°00'
111°45'
40°15'
WASATCH
RANGE
TRAVERSE MOUNTAINS
LAKE MOUNTAINS
UTAH
Pleasant Grove
American Fork
Lehi
Alpine
Pelican Point
UNION
PACIFIC
Jordan River
Jordan Narrows
U-68
U-73
U-74
U-80
Match Line
Match Line

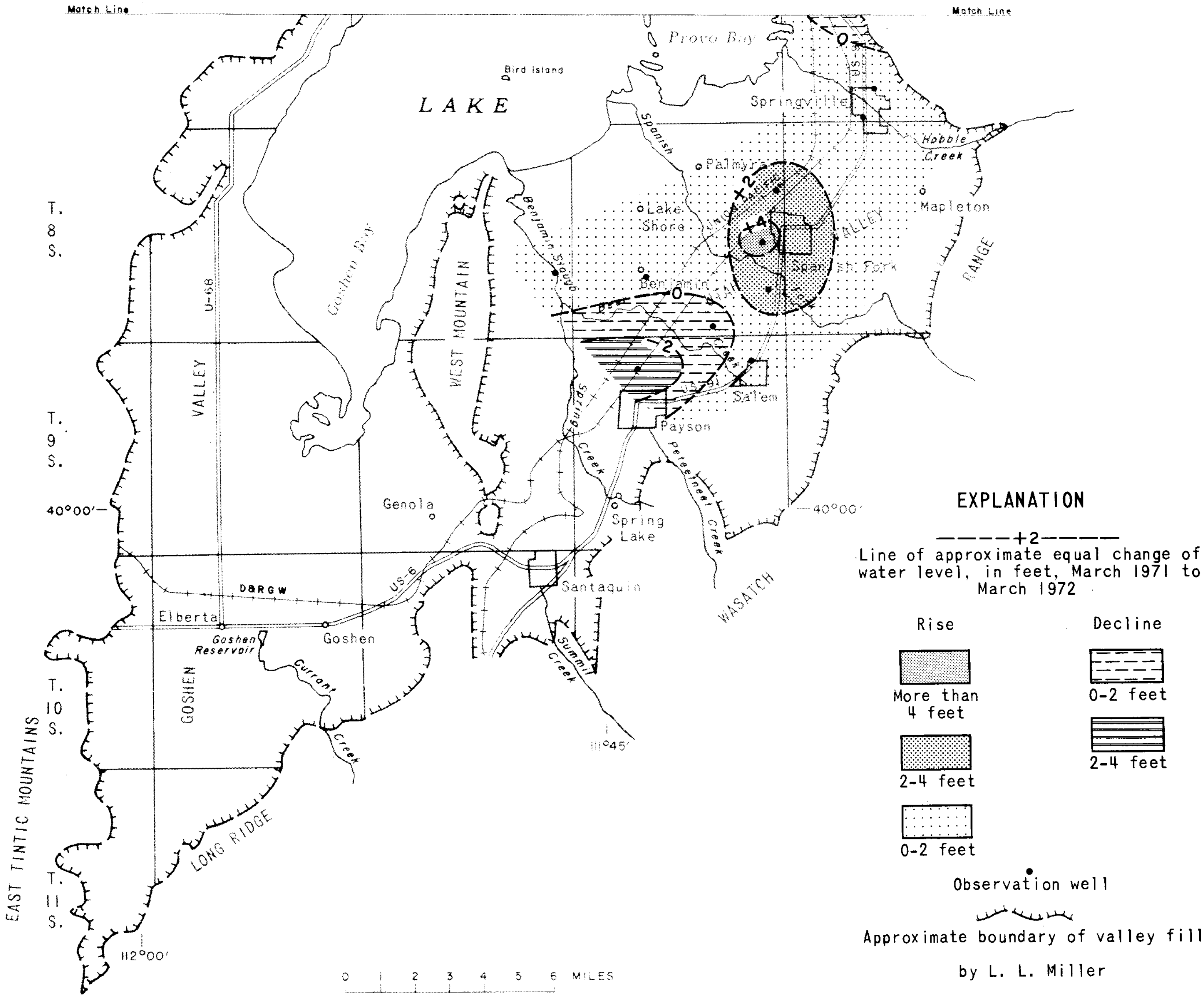
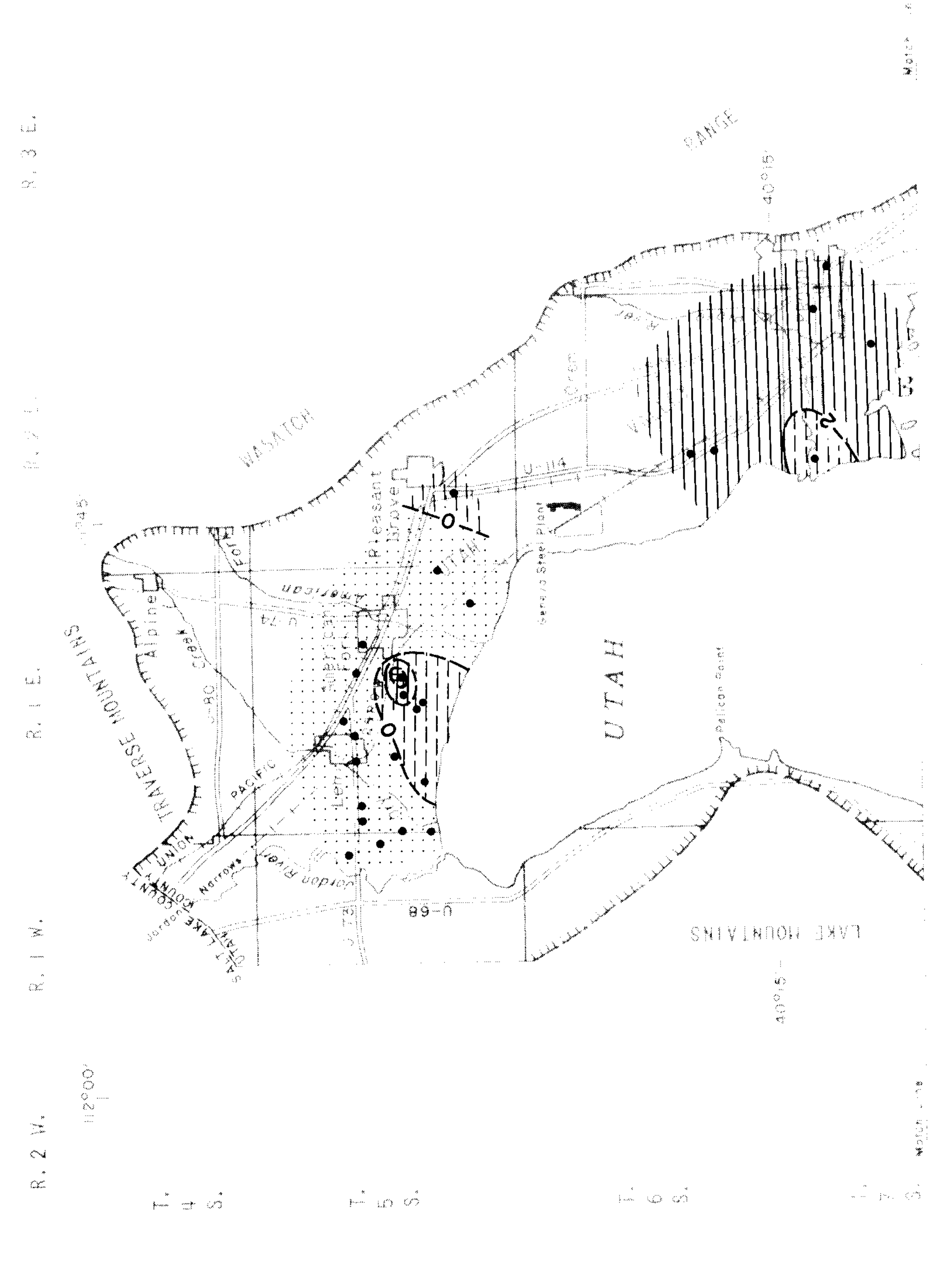


Figure 12.—Map of Utah and Goshen Valleys showing change of water levels in the shallow artesian aquifer in rocks of Pleistocene age from March 1971 to March 1972.


R. 2 W.
R. 1 W.
R. 1 E.
R. 2 E.
R. 3 E.
T. 4 S.
T. 5 S.
T. 6 S.
112°00'
40°15'
TRAVERSE MOUNTAINS
WASATCH
RANGE
LAKE MOUNTAINS
UTAH
Alpine
Pleasant Grove
Geneva Steel Plant
Pelican Point
Jordan Narrows
Jordan River
UNION PACIFIC
U-68
U-114
U-74

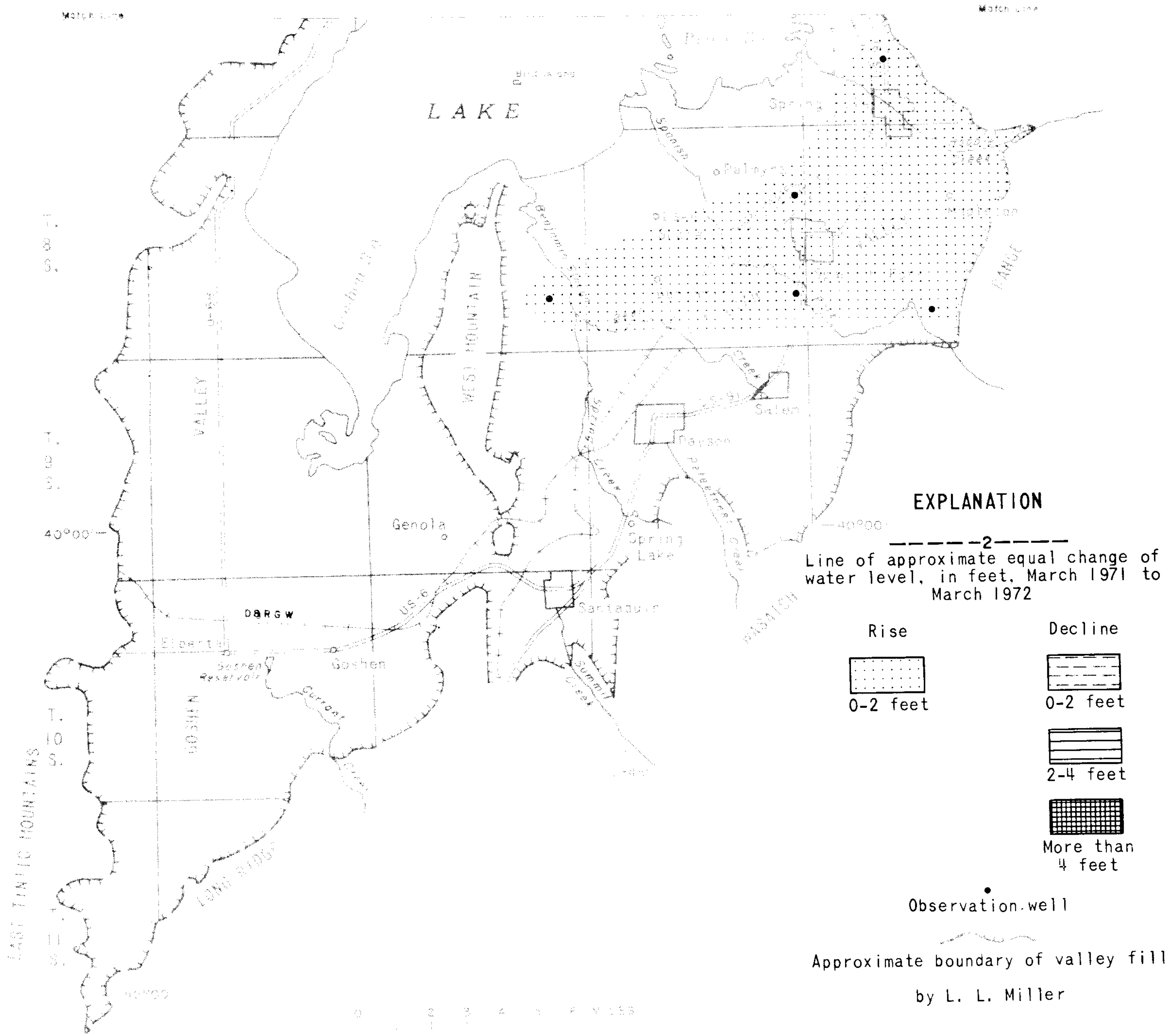
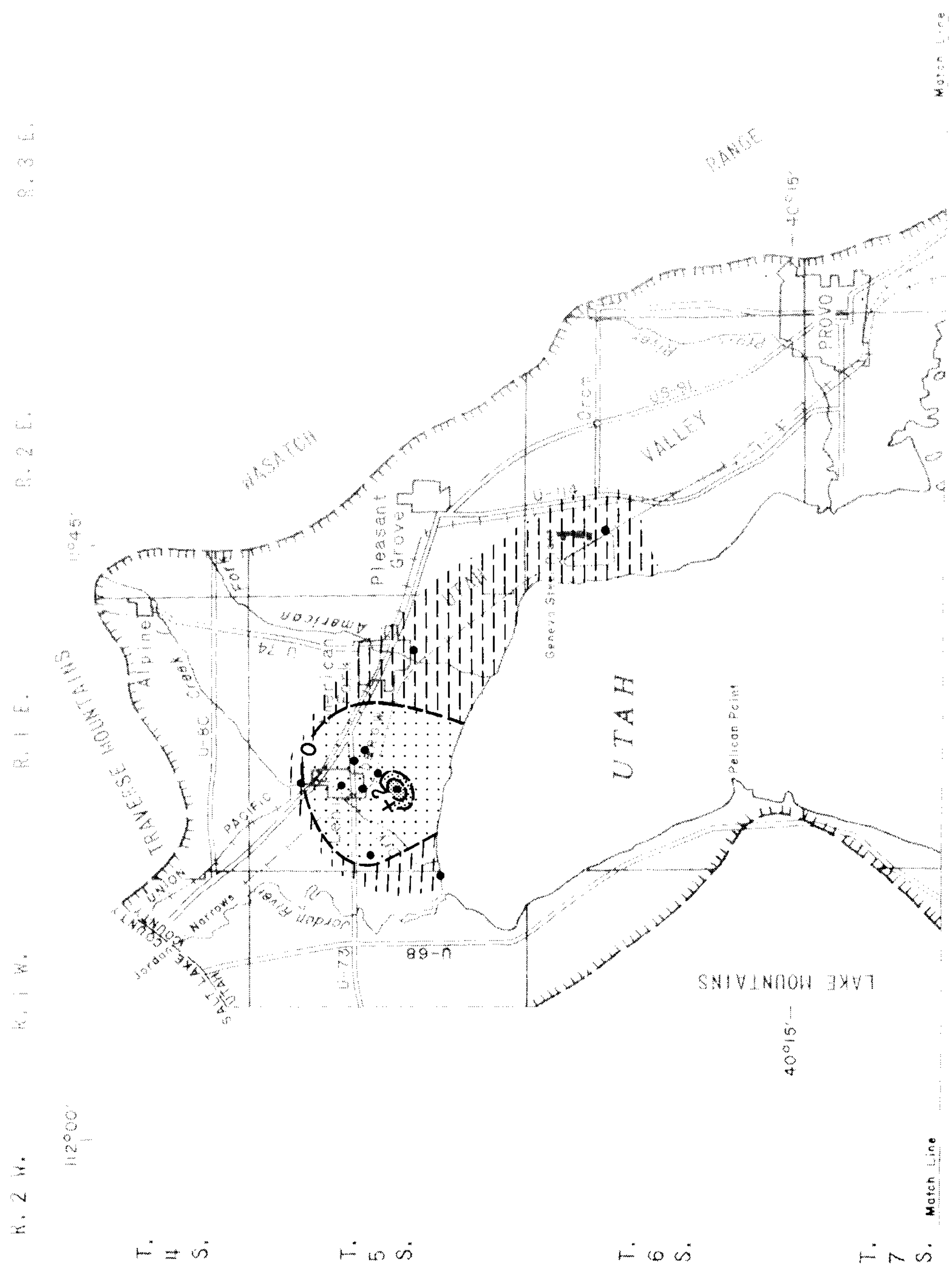


Figure 13.—Map of Utah and Goshen Valleys showing change of water levels in the deep artesian aquifer in rocks of Pleistocene age from March 1971 to March 1972.



R. 2 W.
R. 1 W.
R. 1 E.
R. 2 E.
R. 3 E.
T. 4 S.
T. 5 S.
T. 6 S.
T. 7 S.
112°00'
40°15'
Match Line
WASATCH
RANGE
TRAVERSE MOUNTAINS
LAKE MOUNTAINS
UTAH
VALLEY
Pleasant Grove
PROVO
Alpine
Orem
Pelican Point
Jordan Narrows
Jordan River
SALT LAKE COUNTY
UTAH COUNTY
UNION PACIFIC
American Fork
U-74
U-68
U-73
US-91

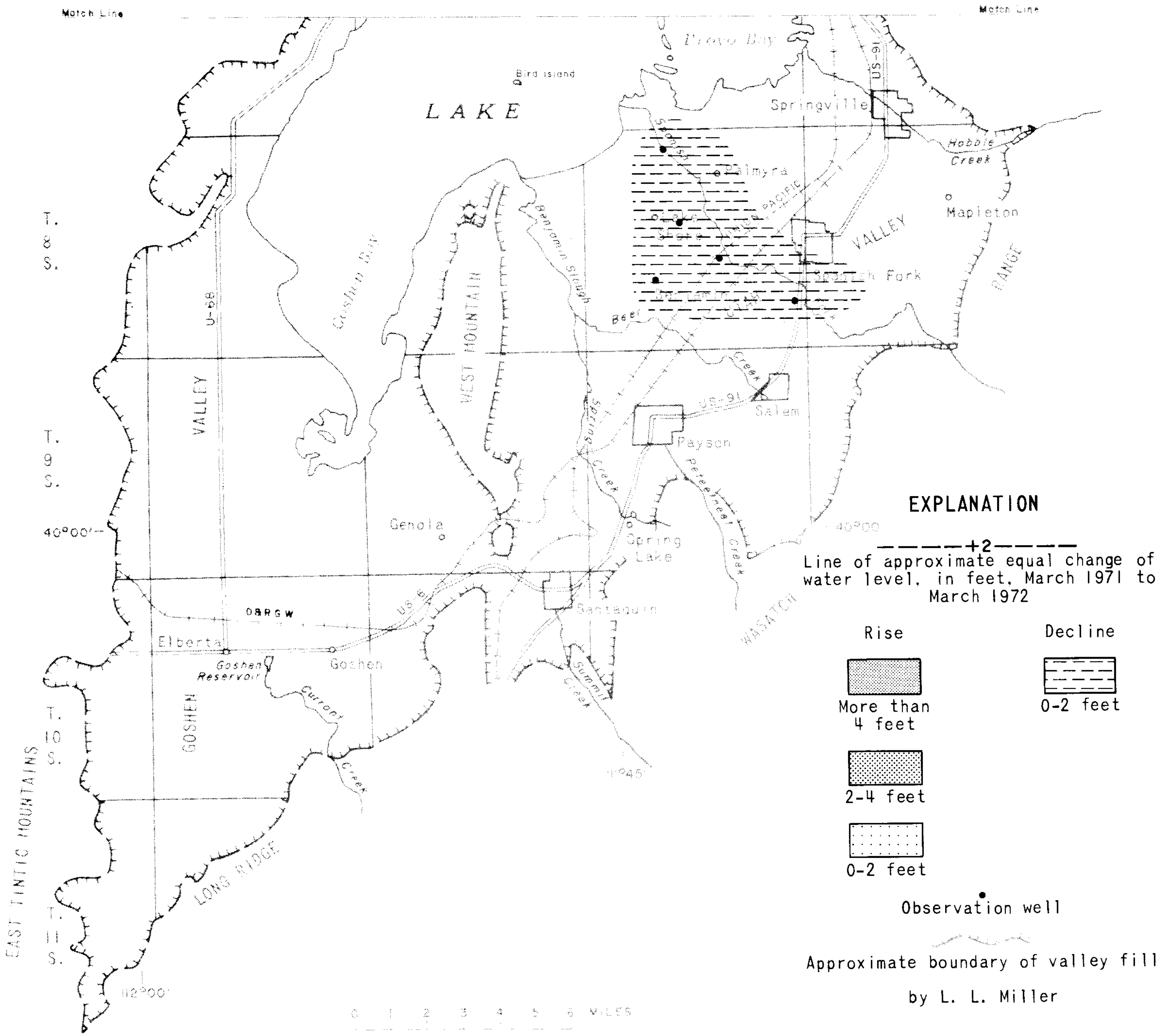


Figure 14.—Map of Utah and Goshen Valleys showing change of water levels in the artesian aquifer in rocks of Tertiary age from March 1971 to March 1972.

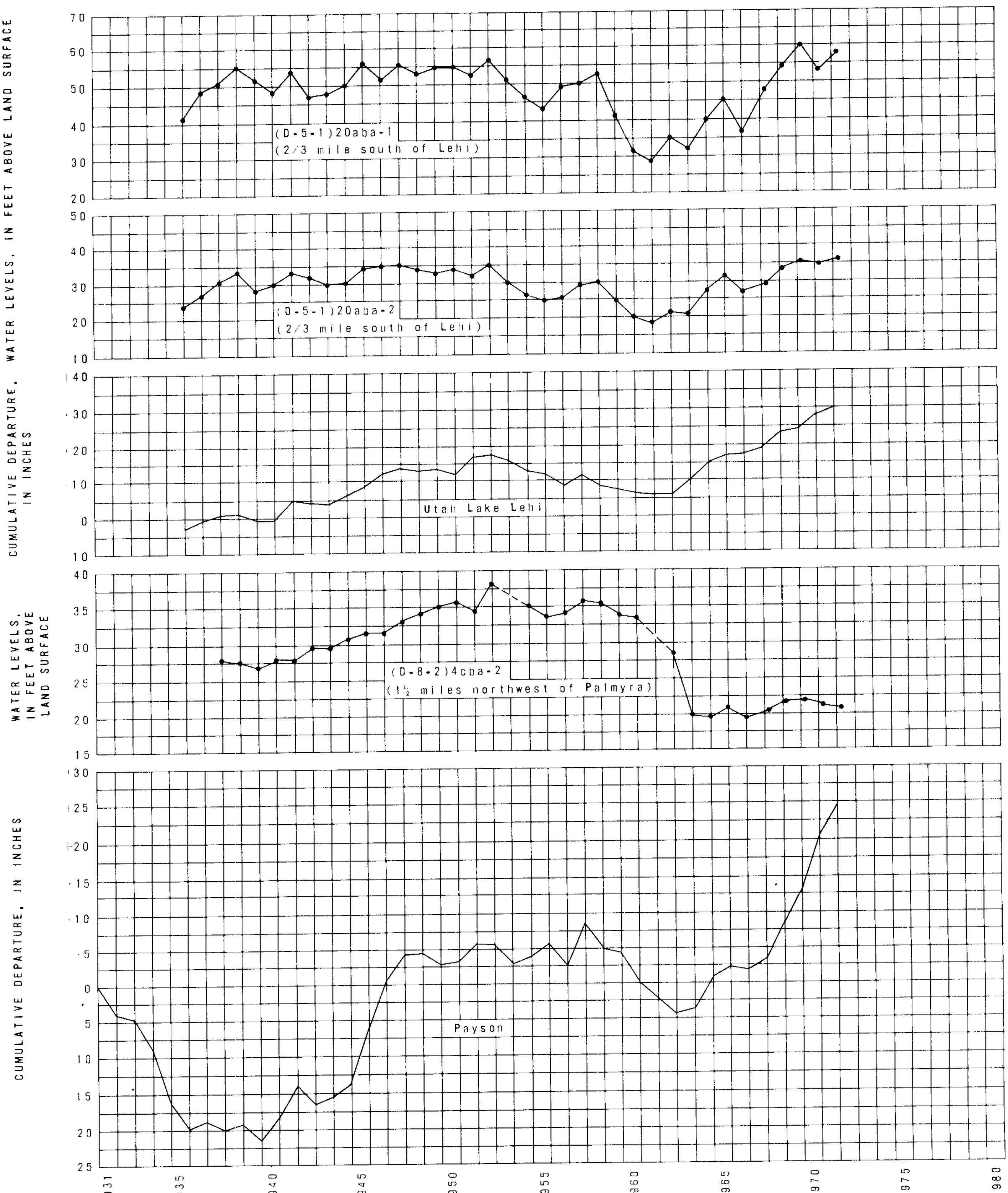
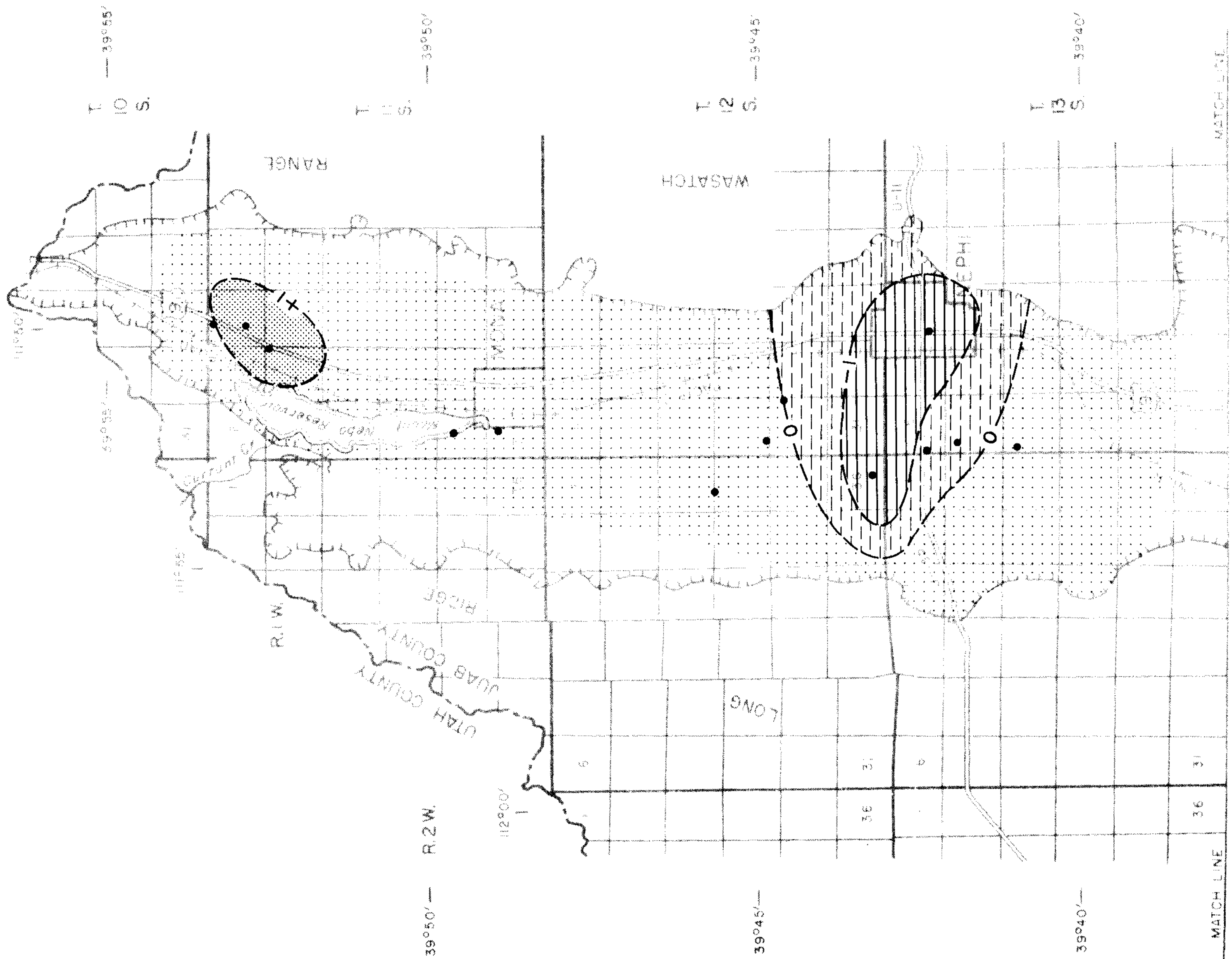


Figure 15.—Relation of water levels in selected observation wells in Utah Valley to cumulative departure from the 1931-60 normal annual precipitation at Utah Lake Lehi and Payson.



WASATCH
RANGE
LONG
RIDGE
UTAH COUNTY
JUAB COUNTY
Mona Reservoir
MONA
R.1 E.
R.1 W.
R.2 W.
T. 12 S.
T. 13 S.
39°55′
39°50′
39°45′
39°40′
112°00′
MATCH LINE

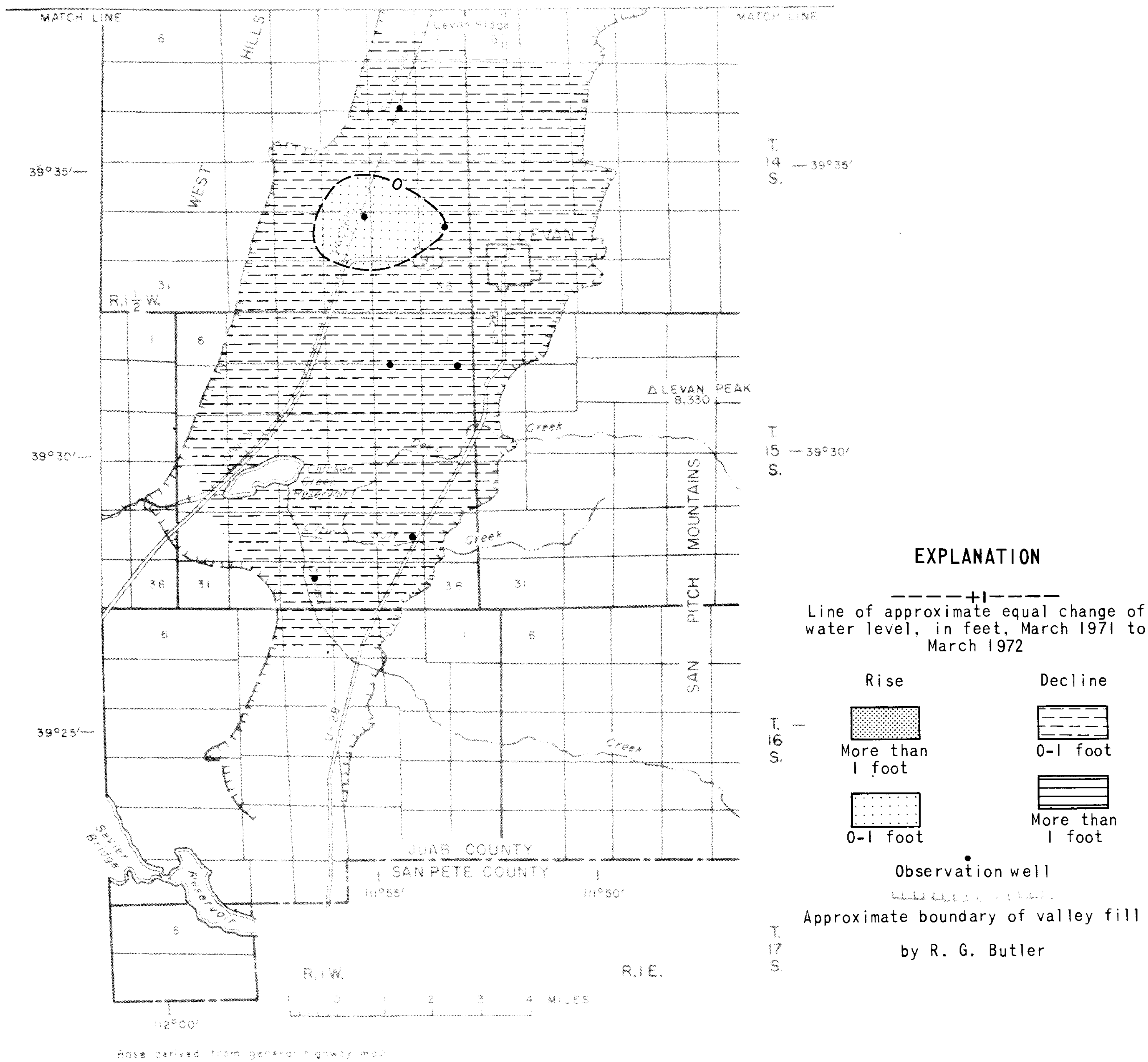


Figure 16.—Map of Juab Valley showing change of water levels from March 1971 to March 1972.

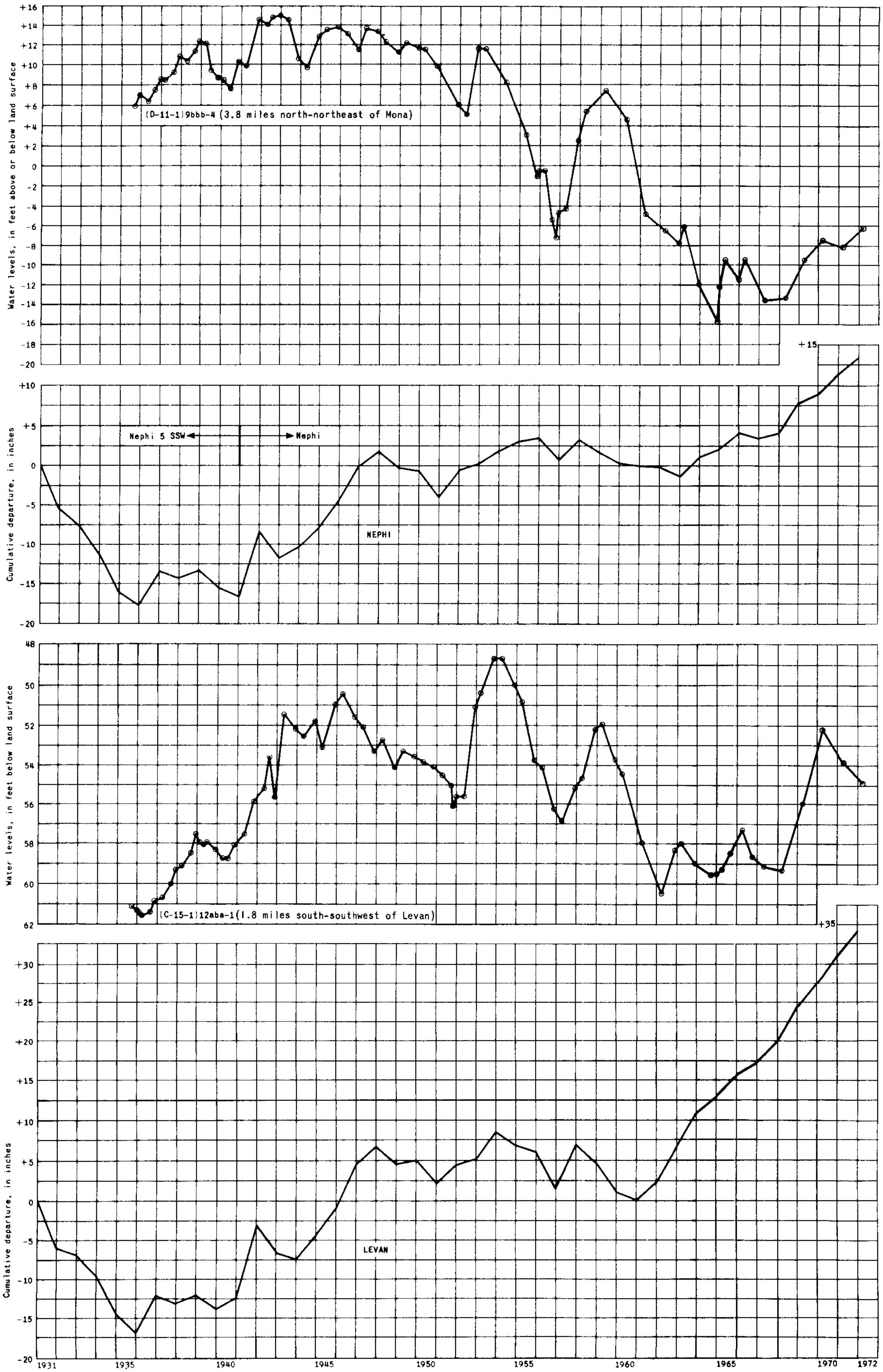


Figure 17.—Relation of water levels in selected wells to cumulative departure from the 1931-60 normal annual precipitation at Nephi and Levan.

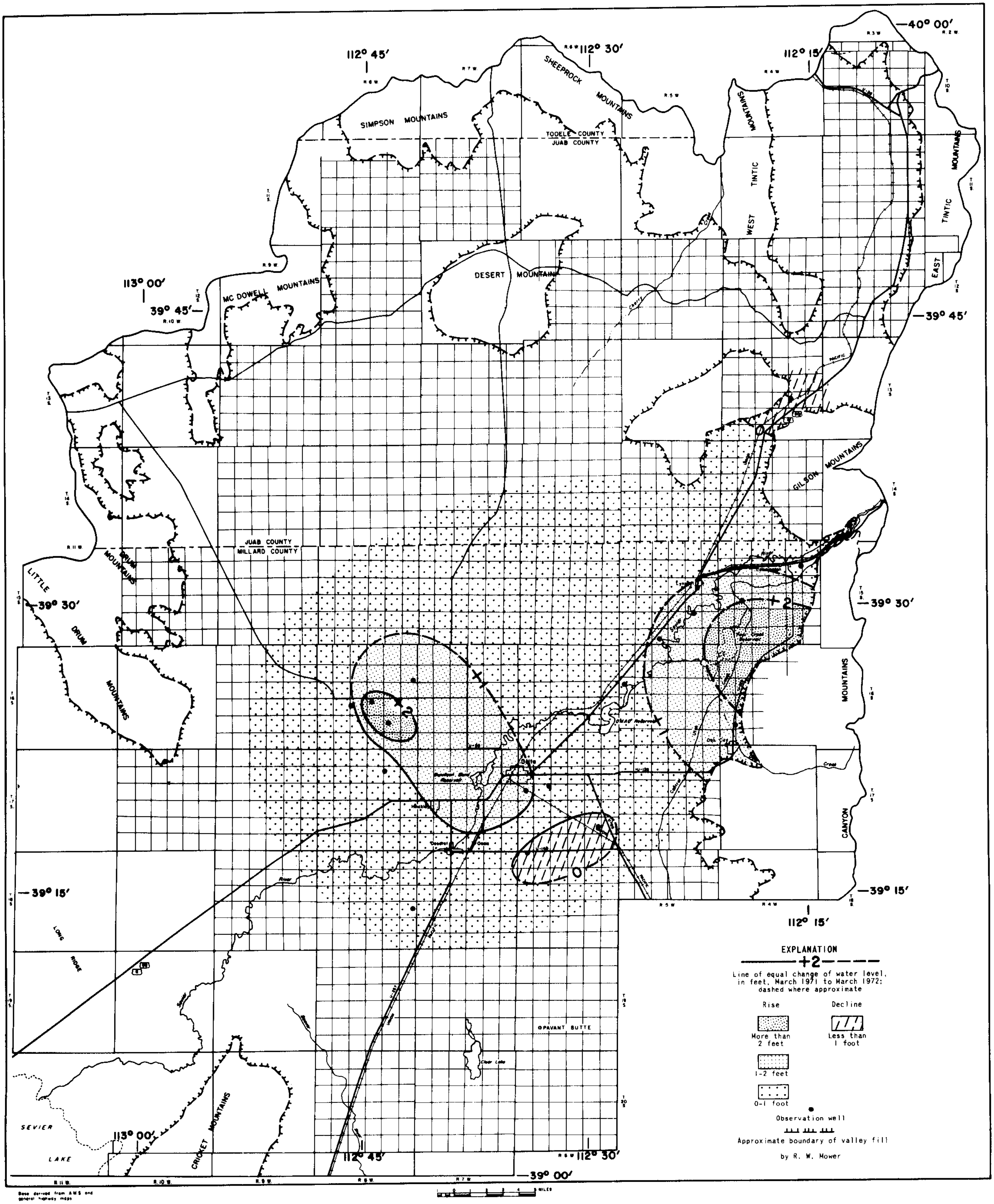


Figure 18.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1971 to March 1972.

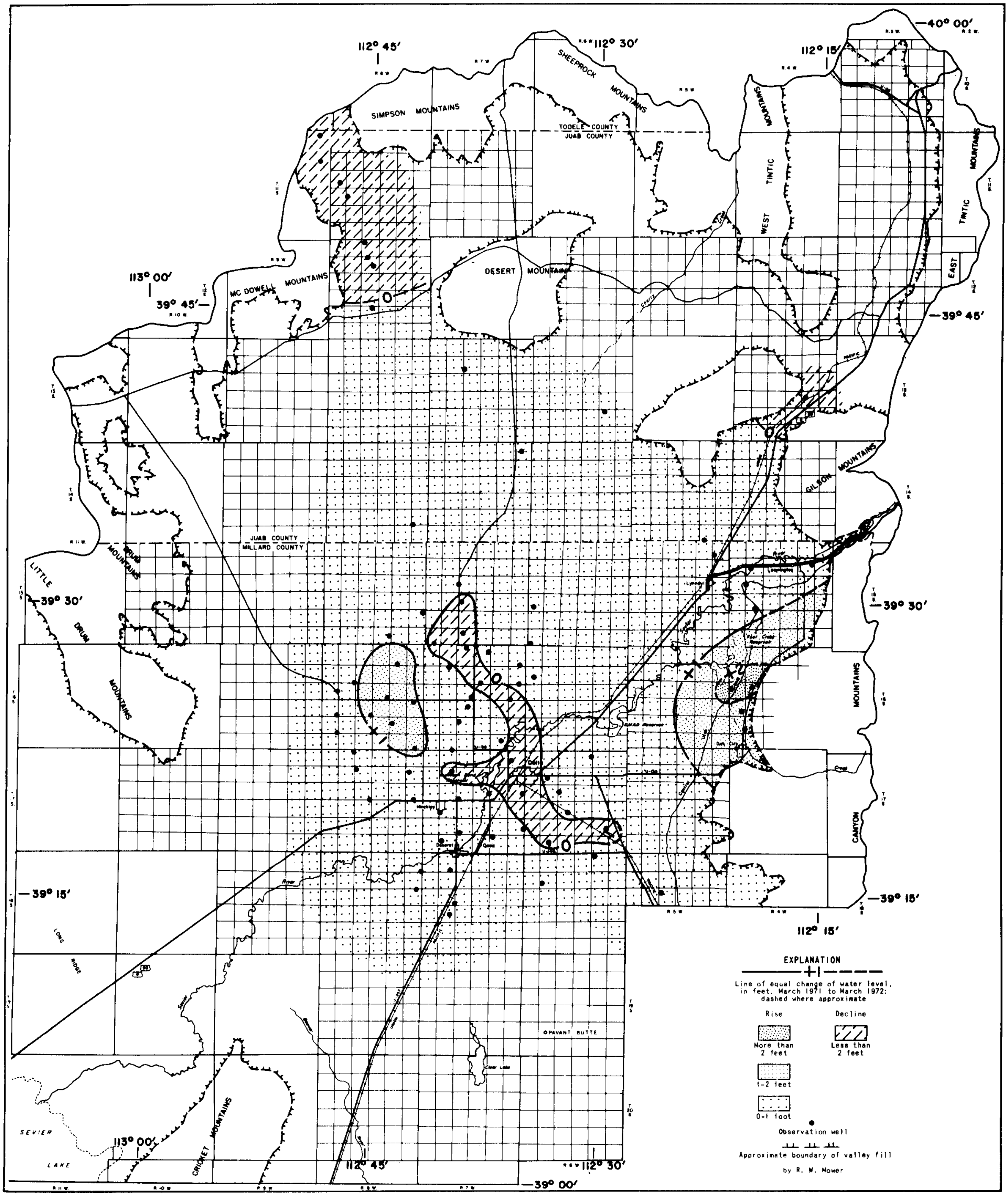


Figure 19.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1971 to March 1972.

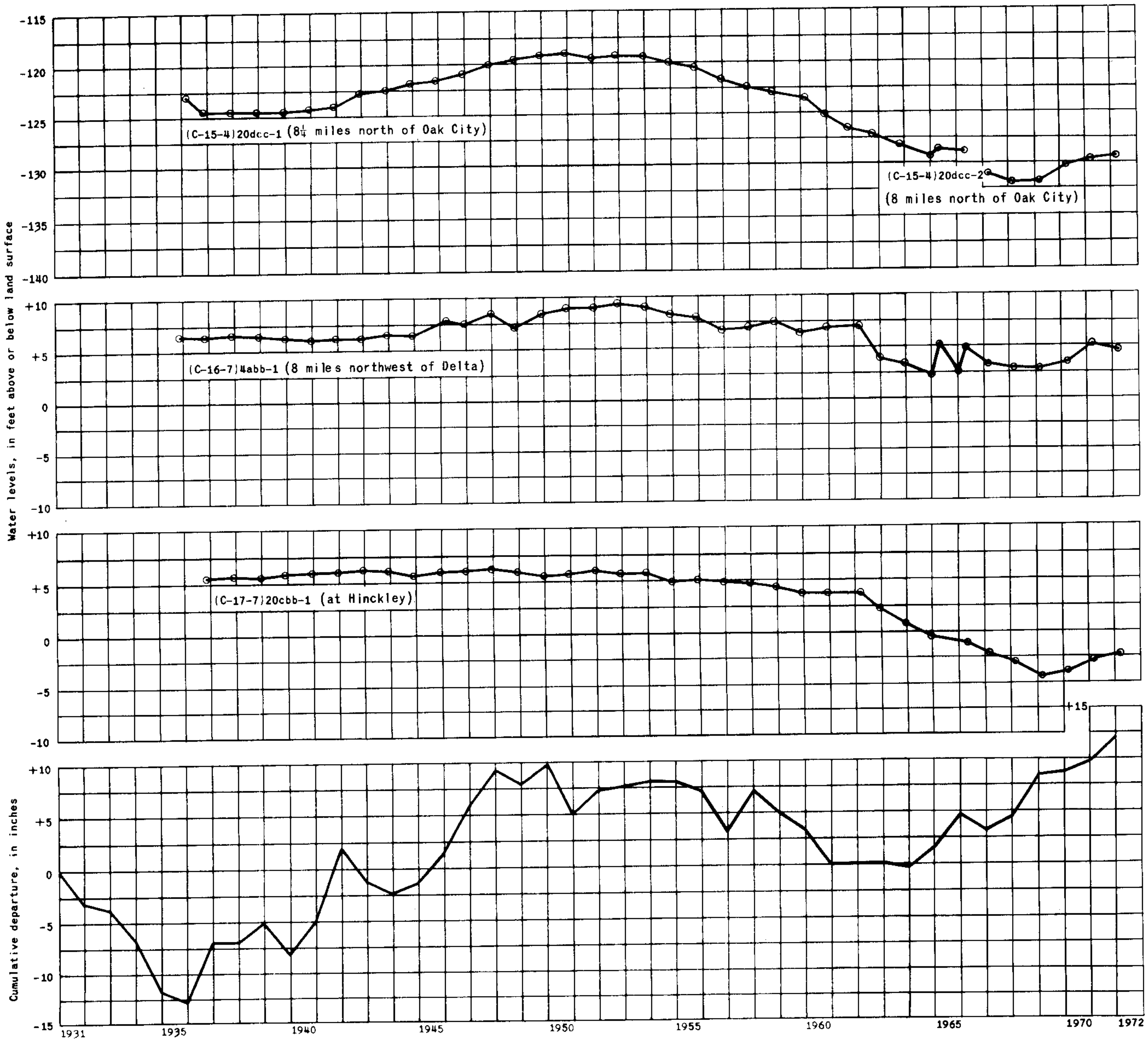


Figure 20.—Relation of water levels in selected wells in the Sevier Desert to cumulative departure from the 1931-60 normal annual precipitation at Oak City.

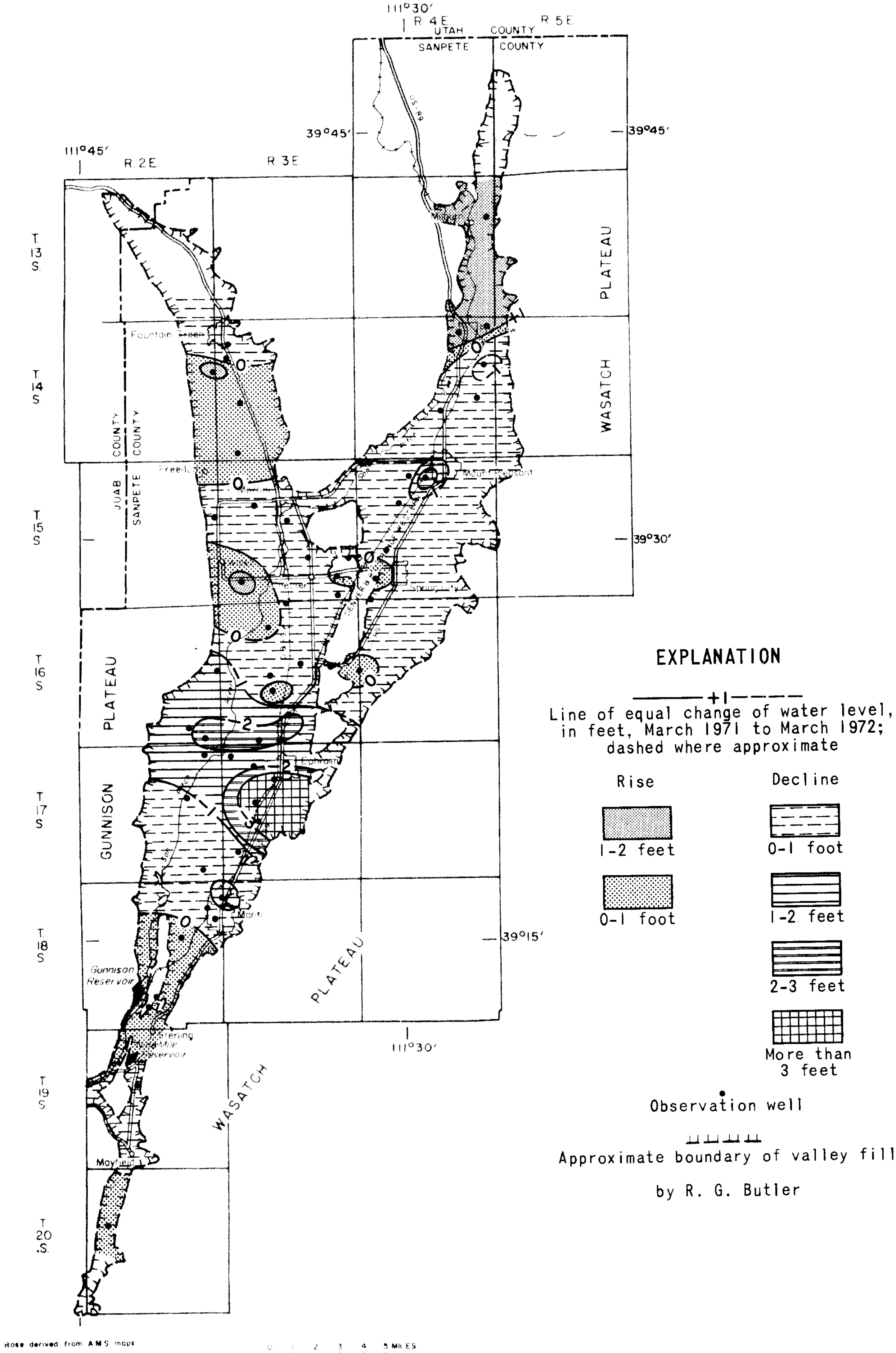


Figure 21.—Map of Sanpete Valley showing change of water levels from March 1971 to March 1972.

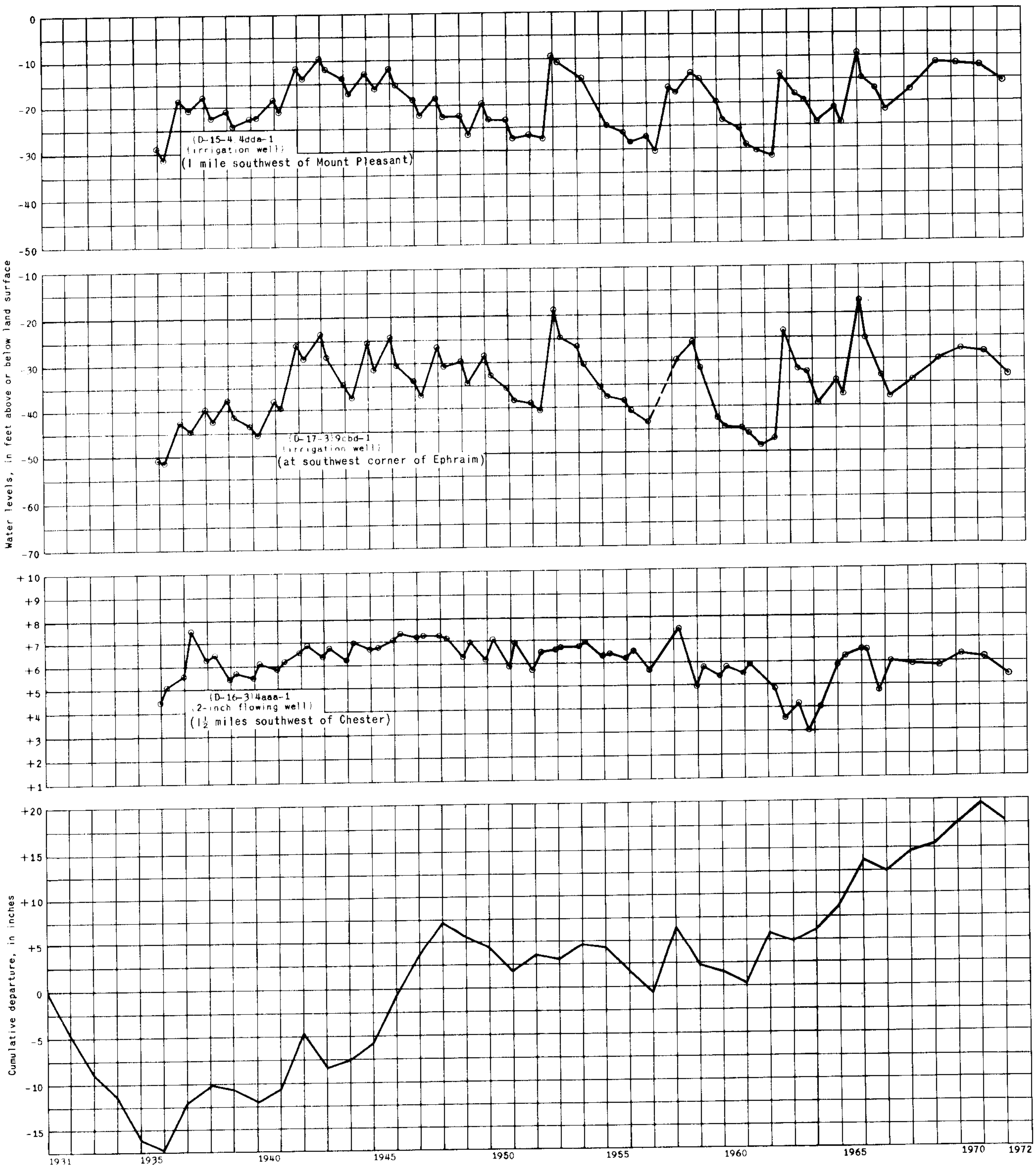
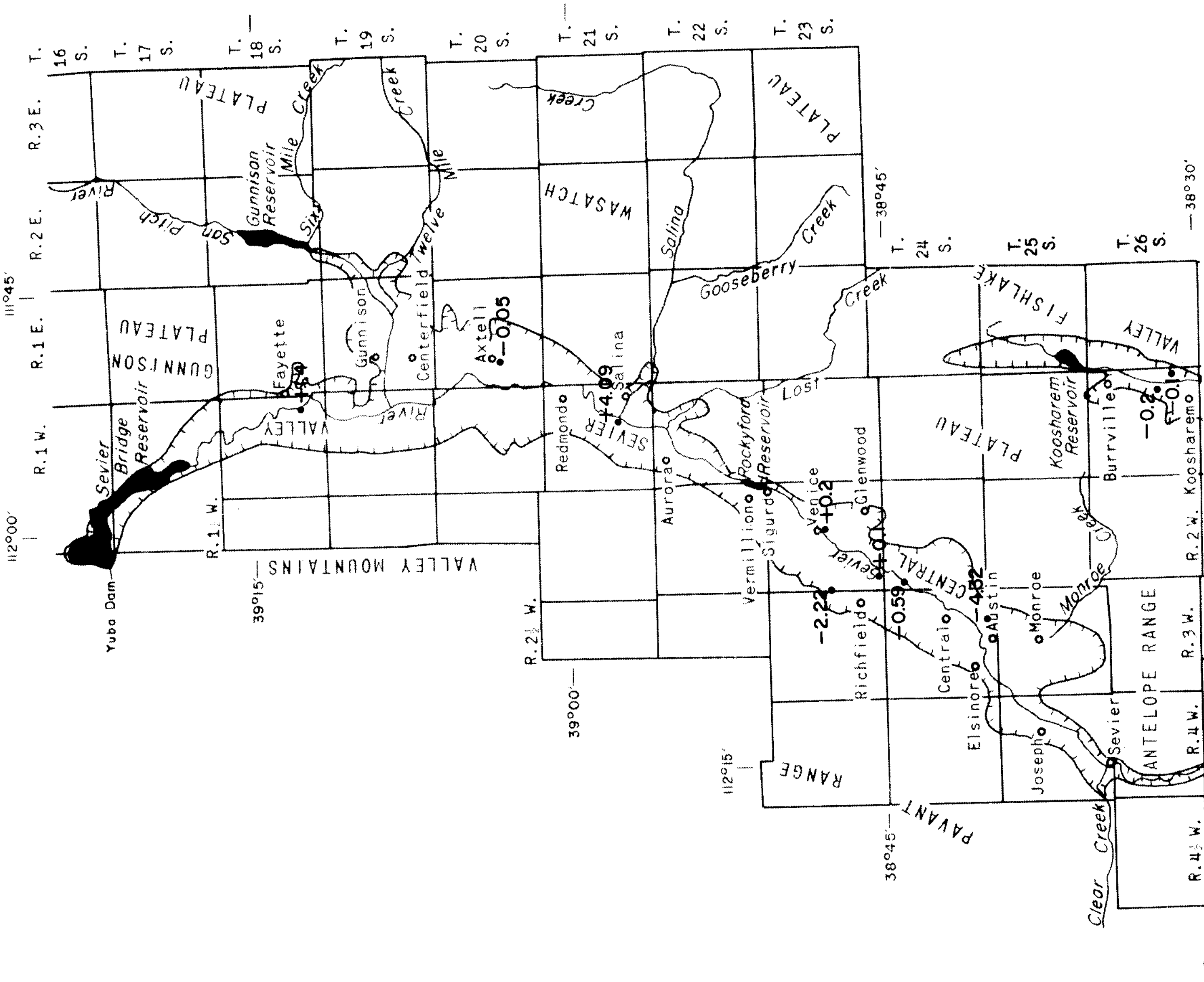


Figure 22.—Relation of water levels in selected wells in Sanpete Valley to cumulative departure from the 1931-60 normal annual precipitation at Manti.



T. 16 S.
T. 17 S.
T. 18 S.
T. 19 S.
T. 20 S.
T. 21 S.
T. 22 S.
T. 23 S.
T. 24 S.
T. 25 S.
T. 26 S.
R. 3 E.
R. 2 E.
R. 1 E.
R. 1 W.
R. 1½ W.
R. 2½ W.
R. 2 W.
R. 3 W.
R. 4 W.
R. 4½ W.
111°45'
112°00'
112°15'
39°15'
39°00'
38°45'
38°30'
Yuba Dam
Sevier Bridge Reservoir
San Pitch River
Gunnison Reservoir
Six Mile Creek
Twelve Mile Creek
Creek
GUNNISON PLATEAU
PLATEAU
WASATCH PLATEAU
VALLEY MOUNTAINS
SEVIER VALLEY
River
Fayette
Gunnison
Centerfield
Axtell
−0.05
+4.09
Salina
Redmondo
Salina Creek
Gooseberry Creek
Lost Creek
Aurora
Rockyford Reservoir
Vermillion
Sigurd
Venice
+0.2
Glenwood
Sevier River
CENTRAL
−2.22
Richfield
−0.59
−4.82
Austin
Monroe
Monroe Creek
Central
Elsinore
Joseph
Sevier
ANTELOPE RANGE
PAVANT RANGE
Clear Creek
FISHLAKE PLATEAU
VALLEY
Koosharem Reservoir
Burrville
Koosharem
−0.2
−0.1

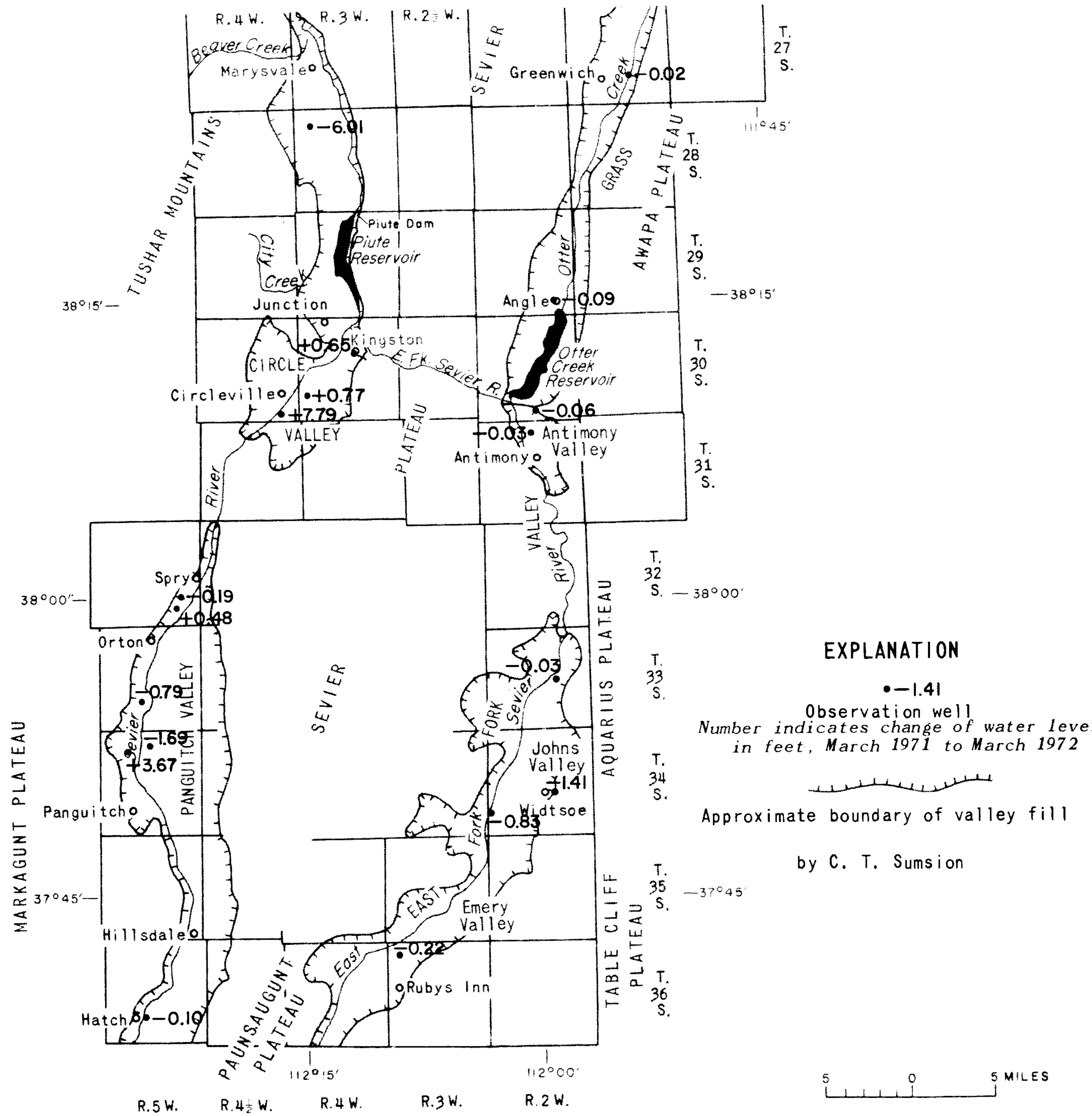


Figure 23.—Map of the upper and central Sevier Valleys showing change of water levels from March 1971 to March 1972.

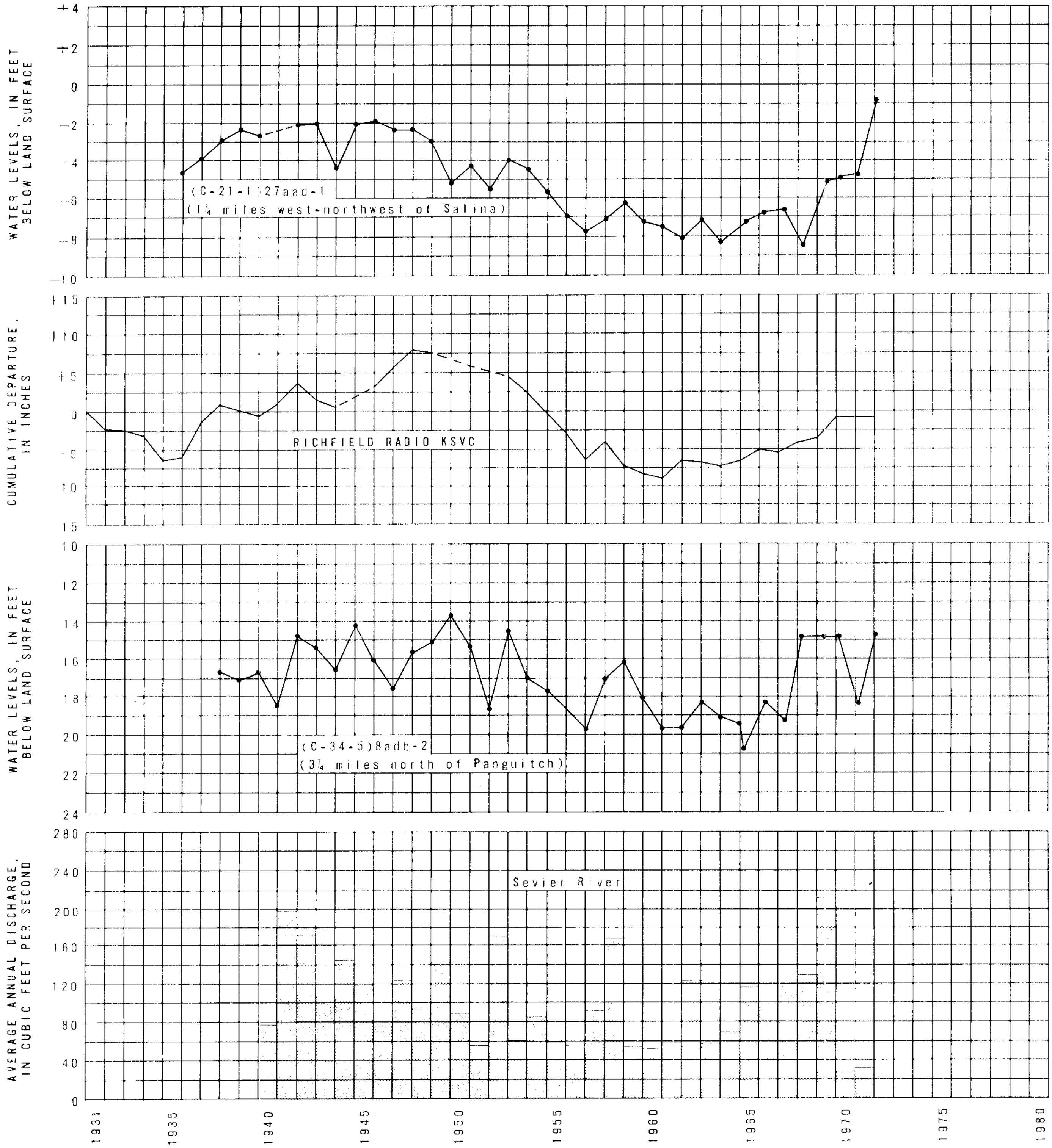
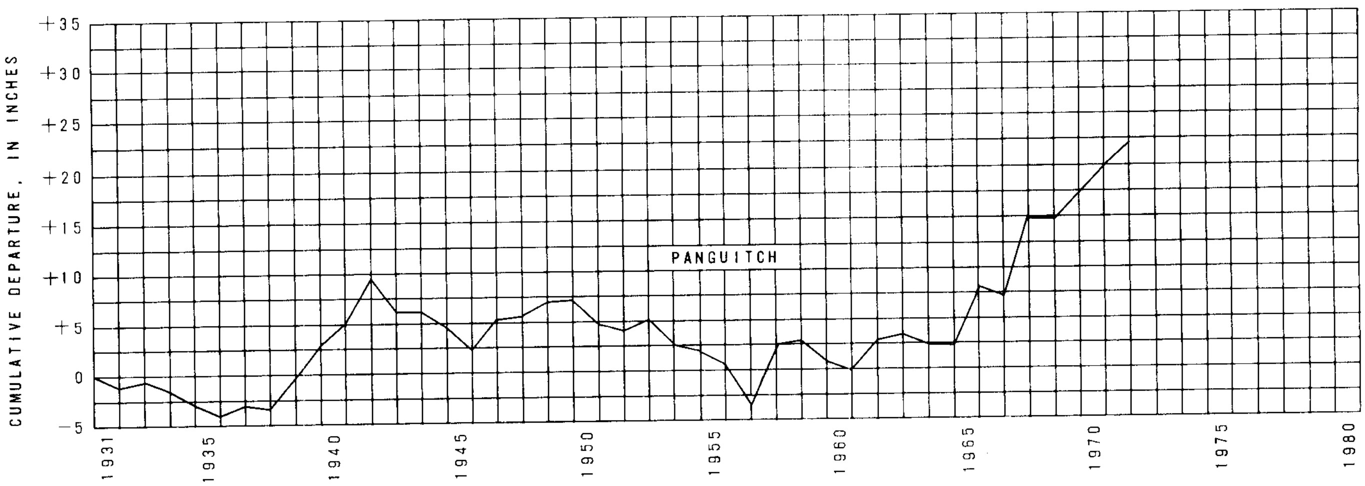


Figure 24.—Relation of water levels in selected wells and of average annual discharge of the Sevier River at Hatch to cumulative departure from the 1931-60 normal annual precipitation at Richfield Radio KSVC and Panguitch.



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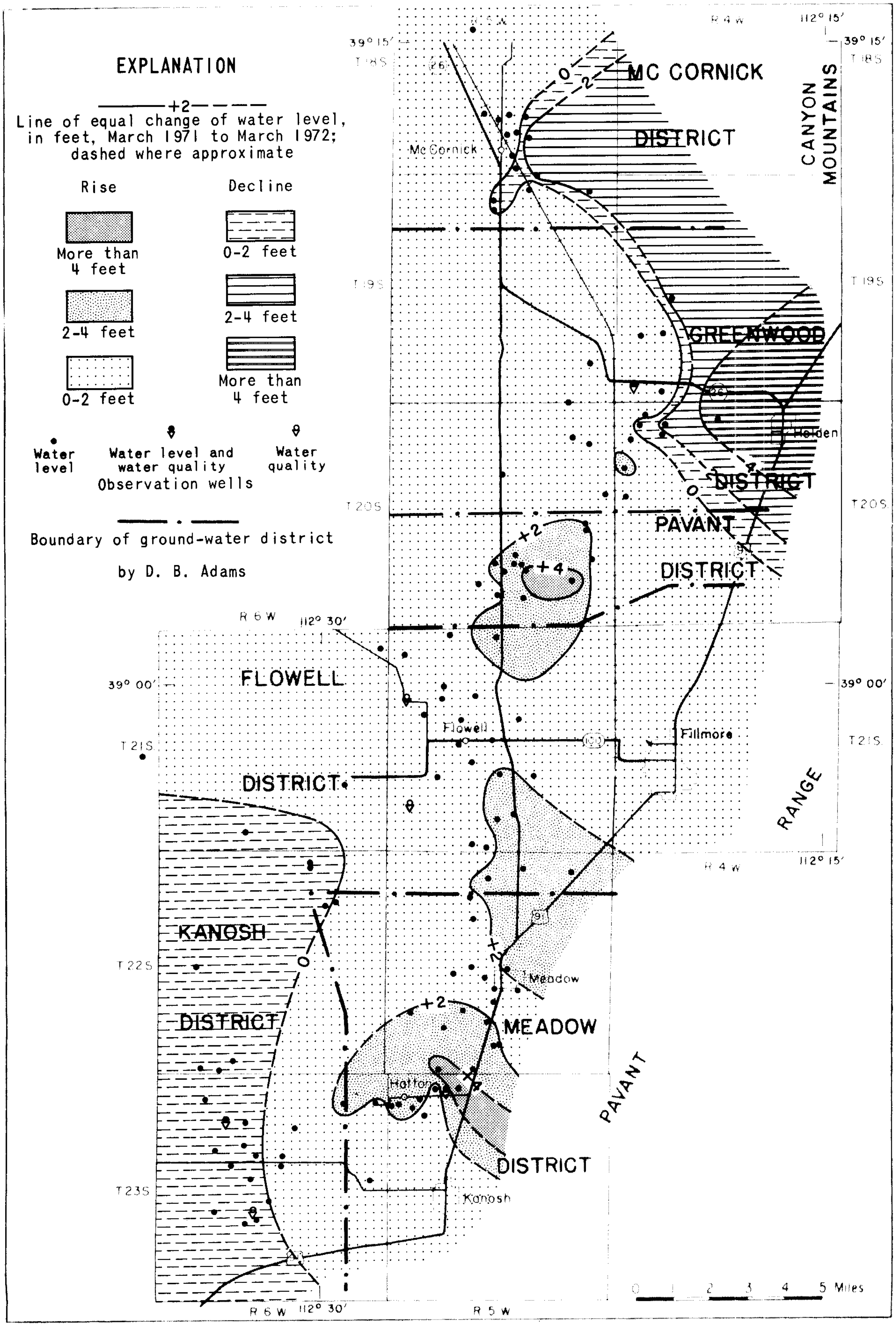


Figure 25.—Map of the Pavant Valley showing change of water levels from March 1971 to March 1972.

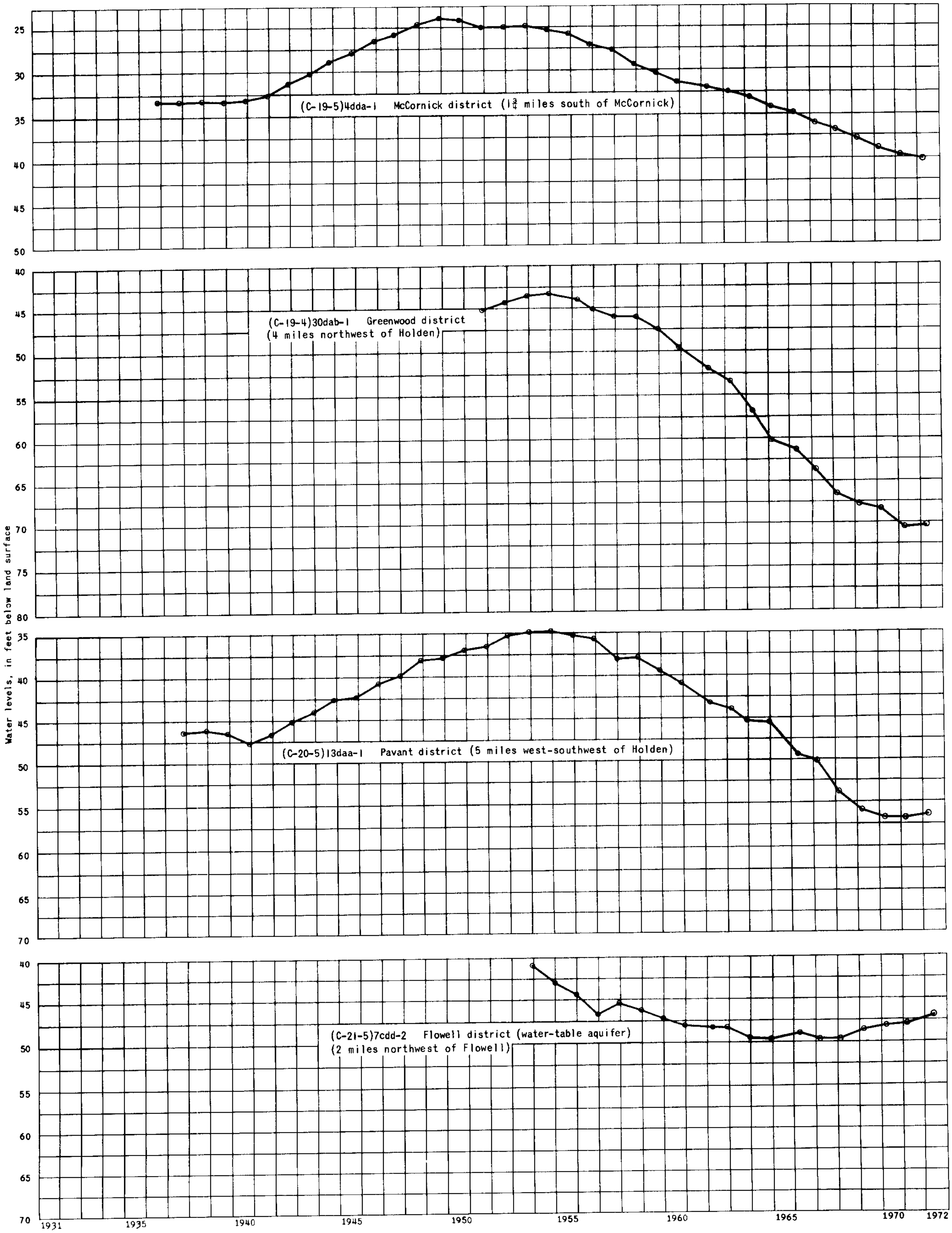
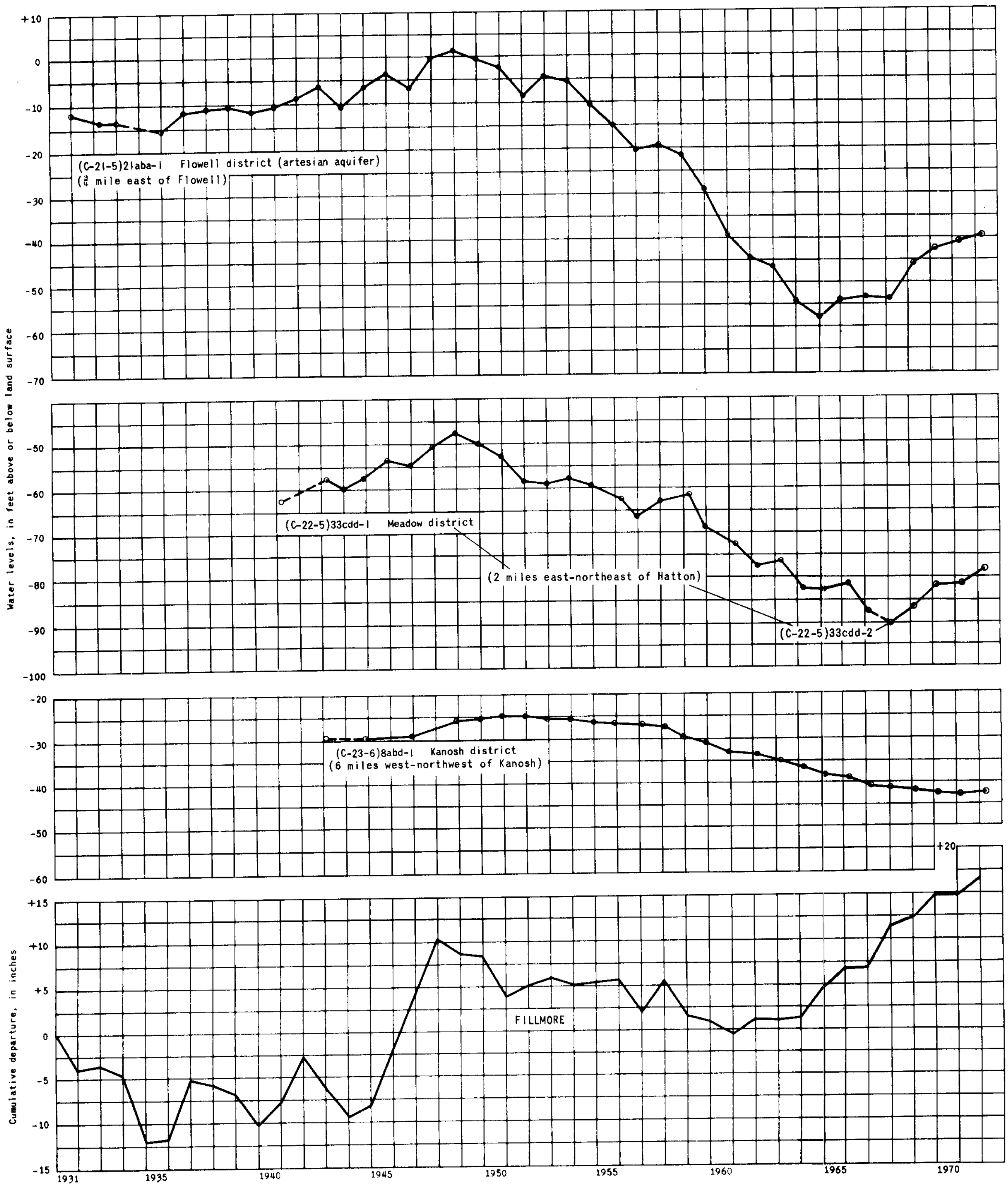


Figure 26.—Relation of water levels in selected wells in Pavant Valley to cumulative departure from the 1931-60 normal annual precipitation at Fillmore.



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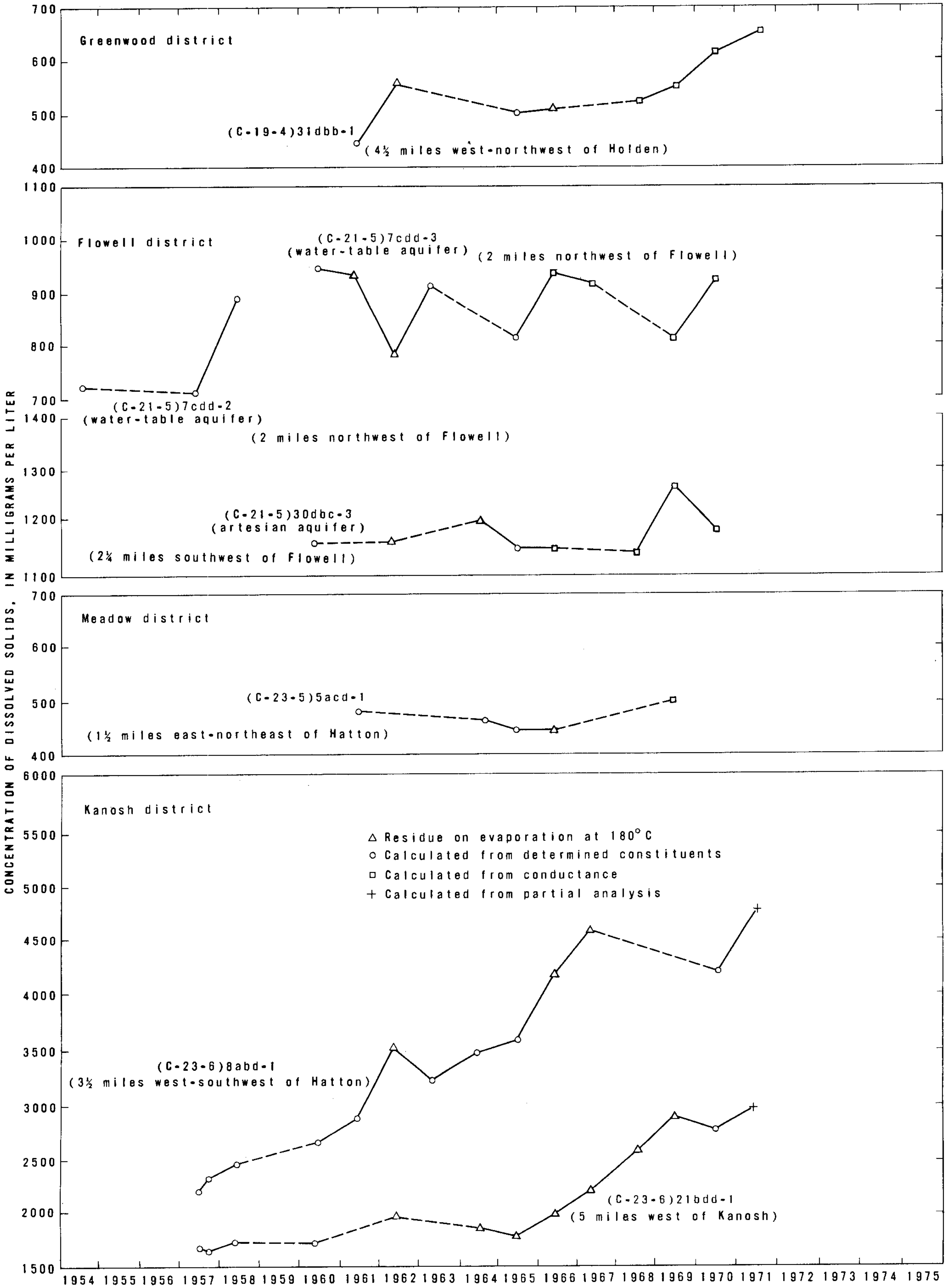


Figure 27.—Concentration of dissolved solids in water from selected wells in Pavant Valley.

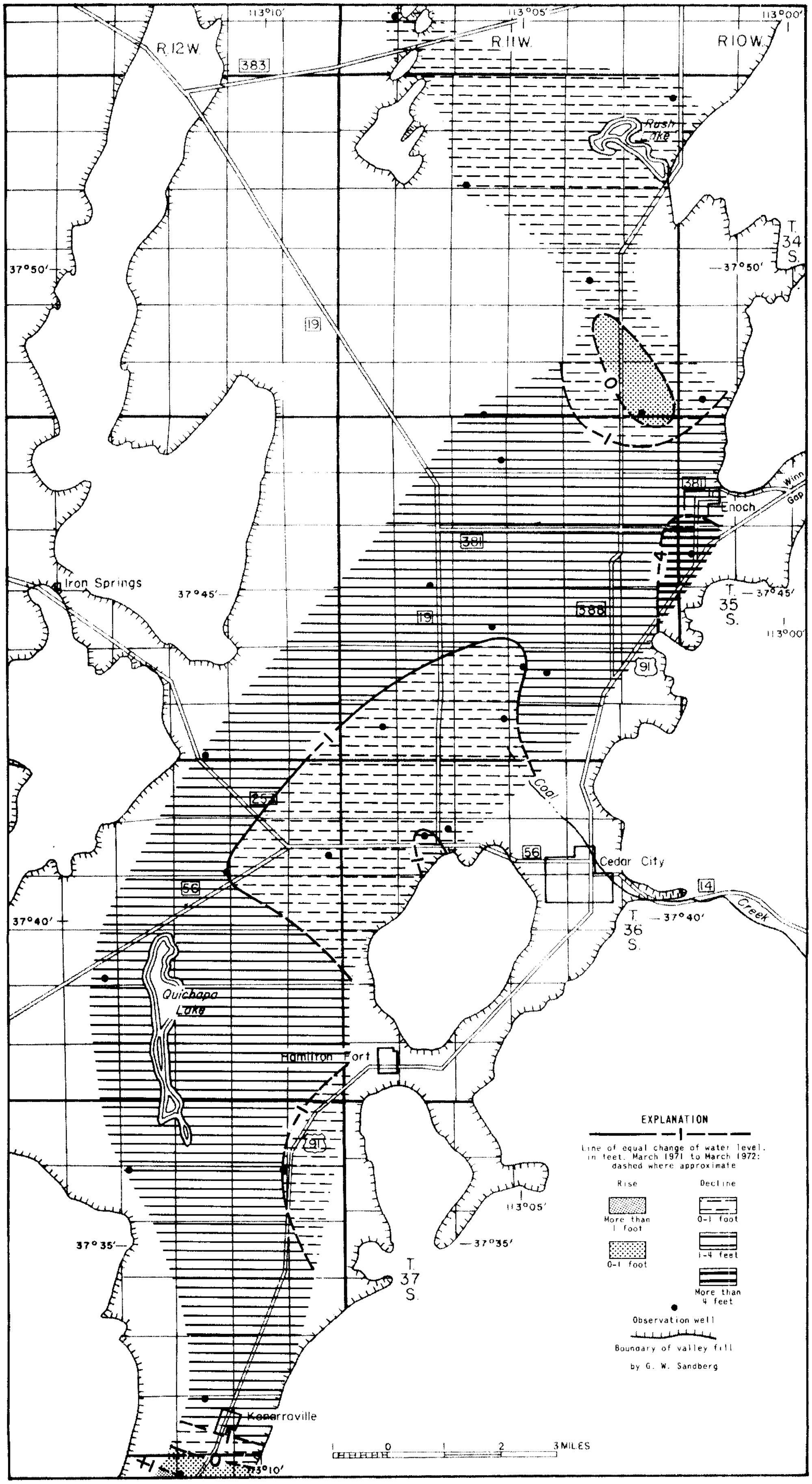


Figure 28.—Map of Cedar City Valley showing change of water levels from March 1971 to March 1972.

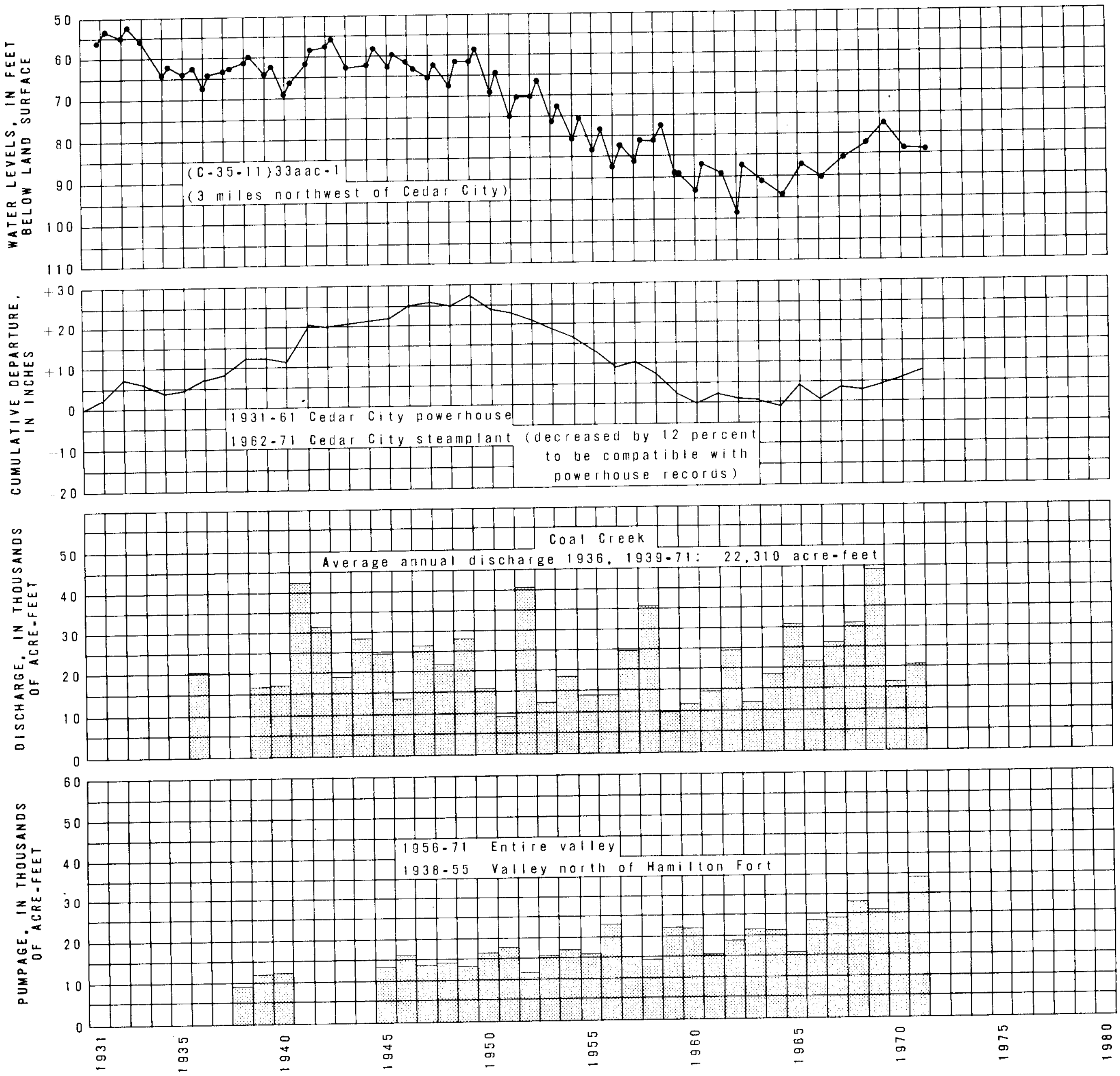


Figure 29.—Relation of water levels in well (C-35-11)33aac-1 to cumulative departure from the 1931-60 normal annual precipitation at the Cedar City powerhouse, to annual discharge of Coal Creek near Cedar City, and to annual pumpage for irrigation in Cedar City Valley.

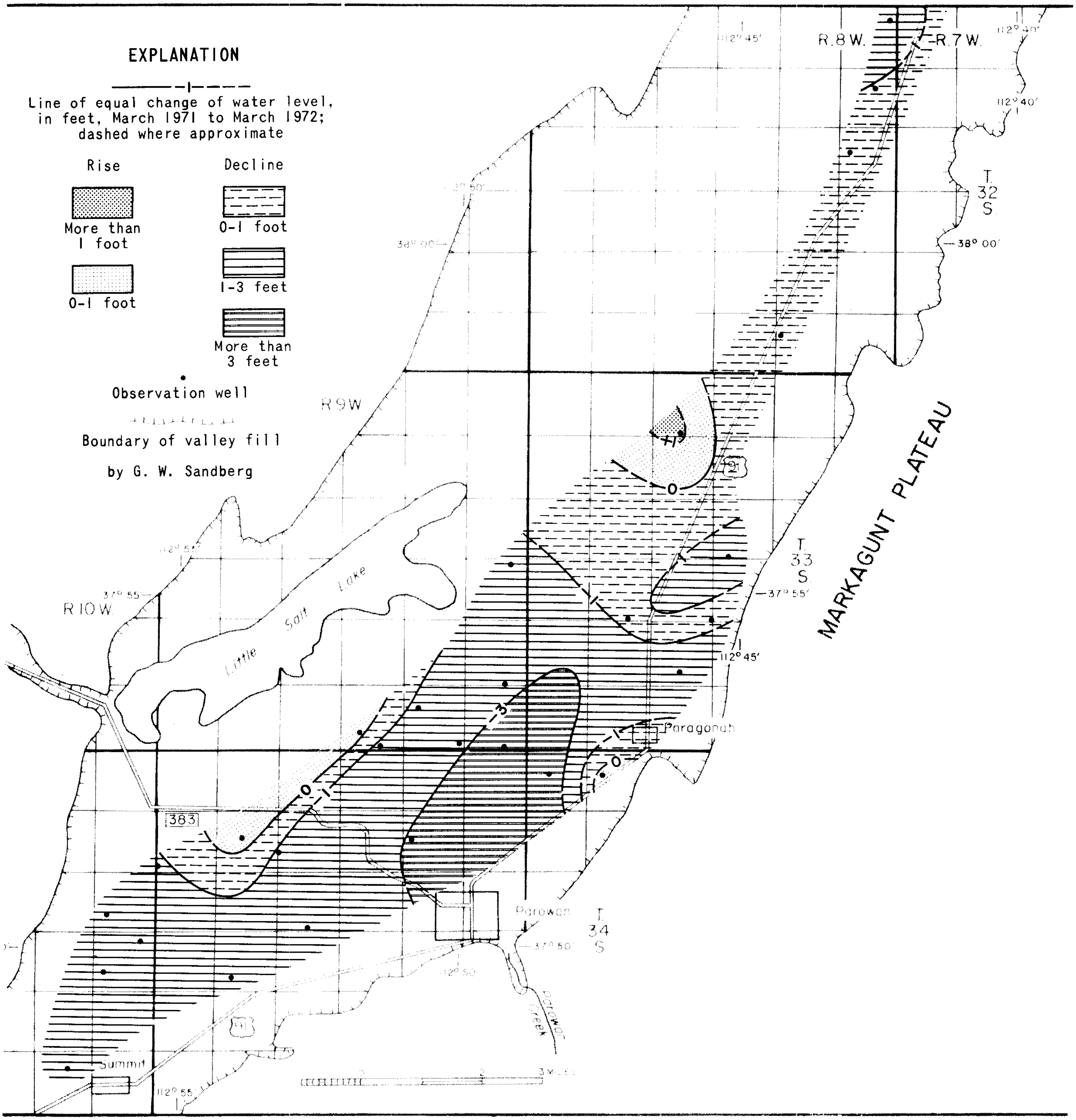


Figure 30.—Map of Parowan Valley showing change of water levels from March 1971 to March 1972.

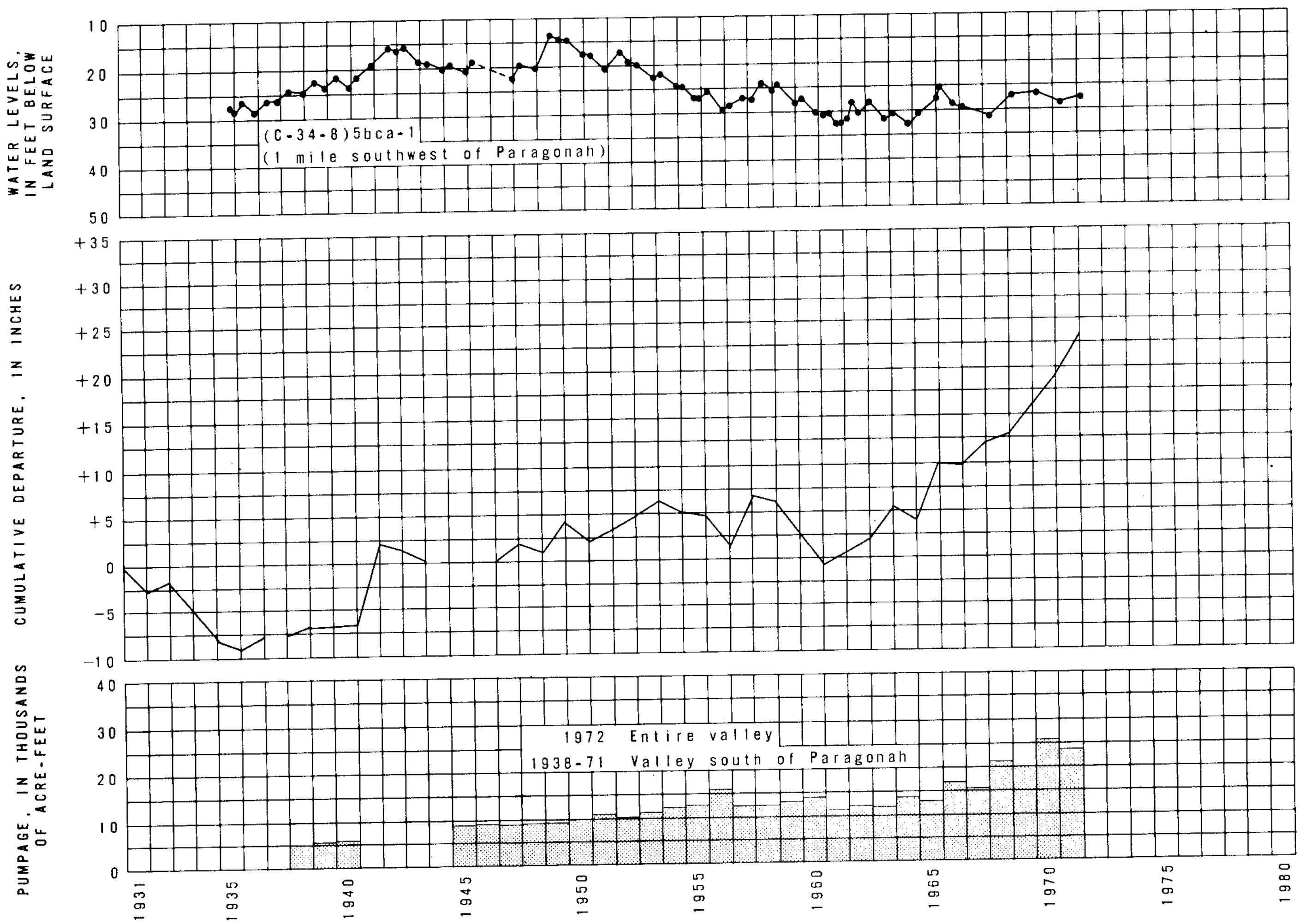


Figure 31.—Relation of water levels in well (C-34-8)5bca-1 to cumulative departure from the 1931-60 normal annual precipitation at Parowan and to pumpage for irrigation in Parowan Valley.

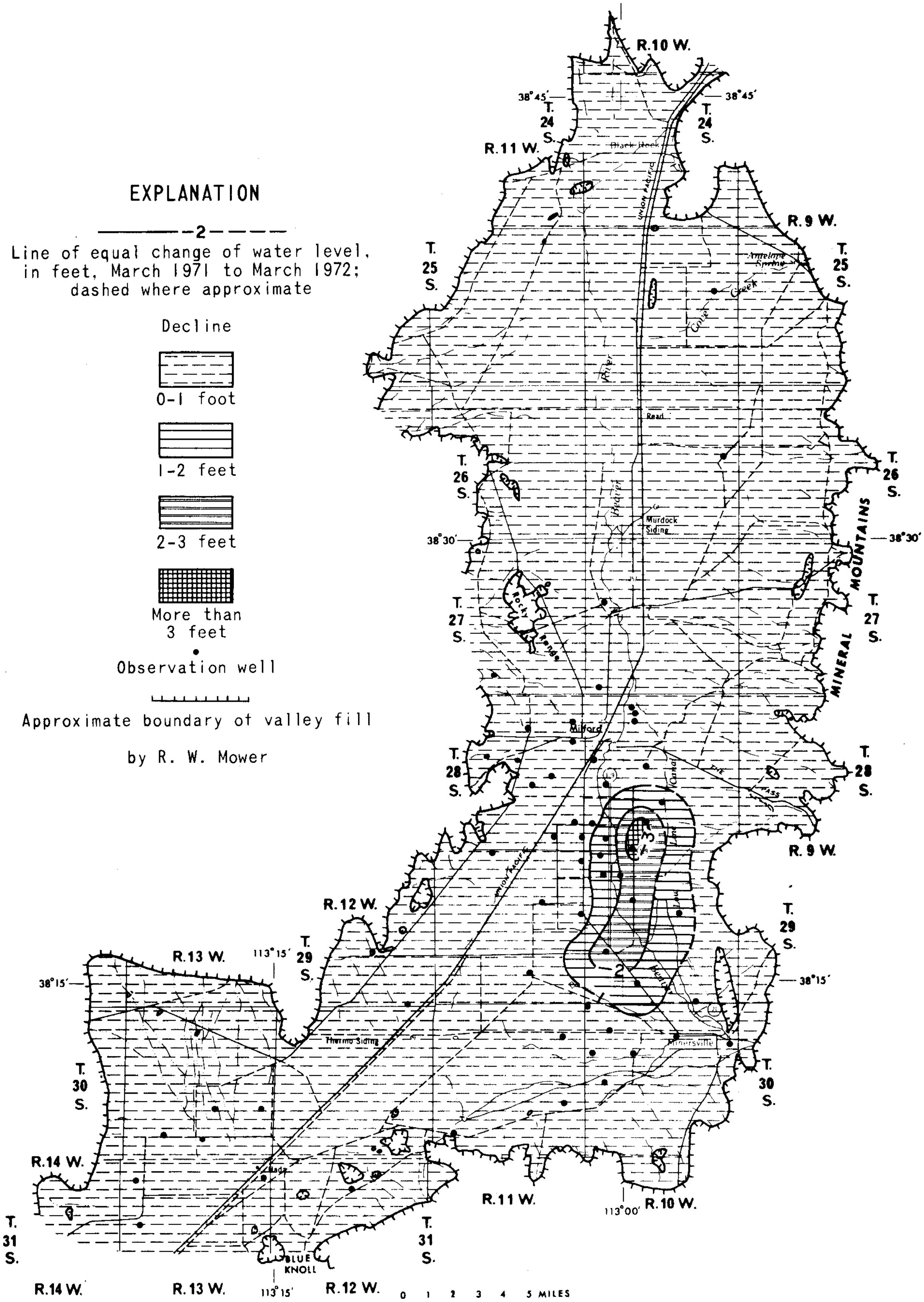


Figure 32.—Map of the Milford district, Escalante Valley, showing change of water levels from March 1971 to March 1972.

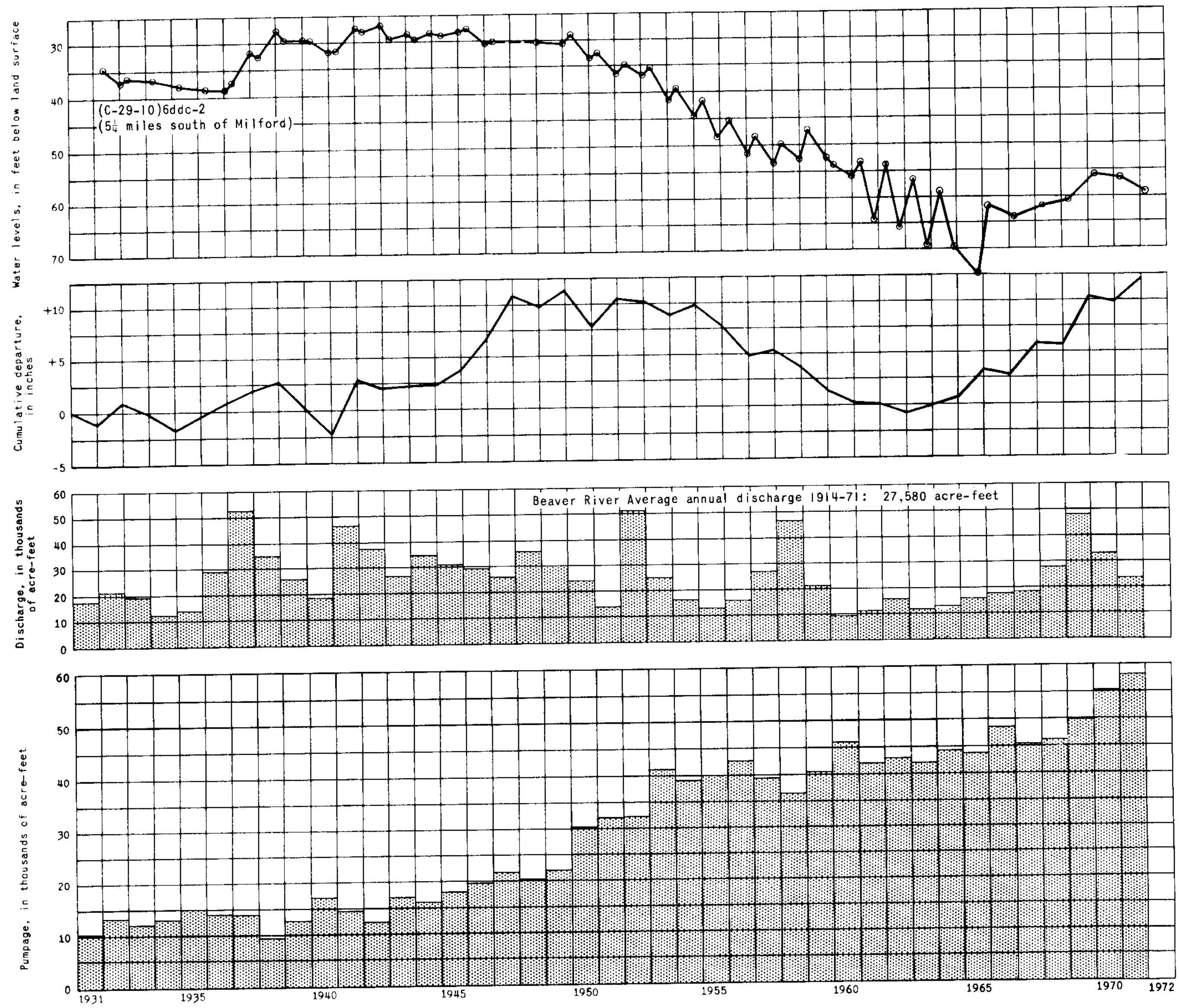


Figure 33.—Relation of water levels in well (C-29-10)6ddc-2 to cumulative departure from the 1931-60 normal annual precipitation at Milford airport, to discharge of Beaver River at Rockyford Dam near Minersville, and to pumpage for irrigation in the Milford district, Escalante Valley.

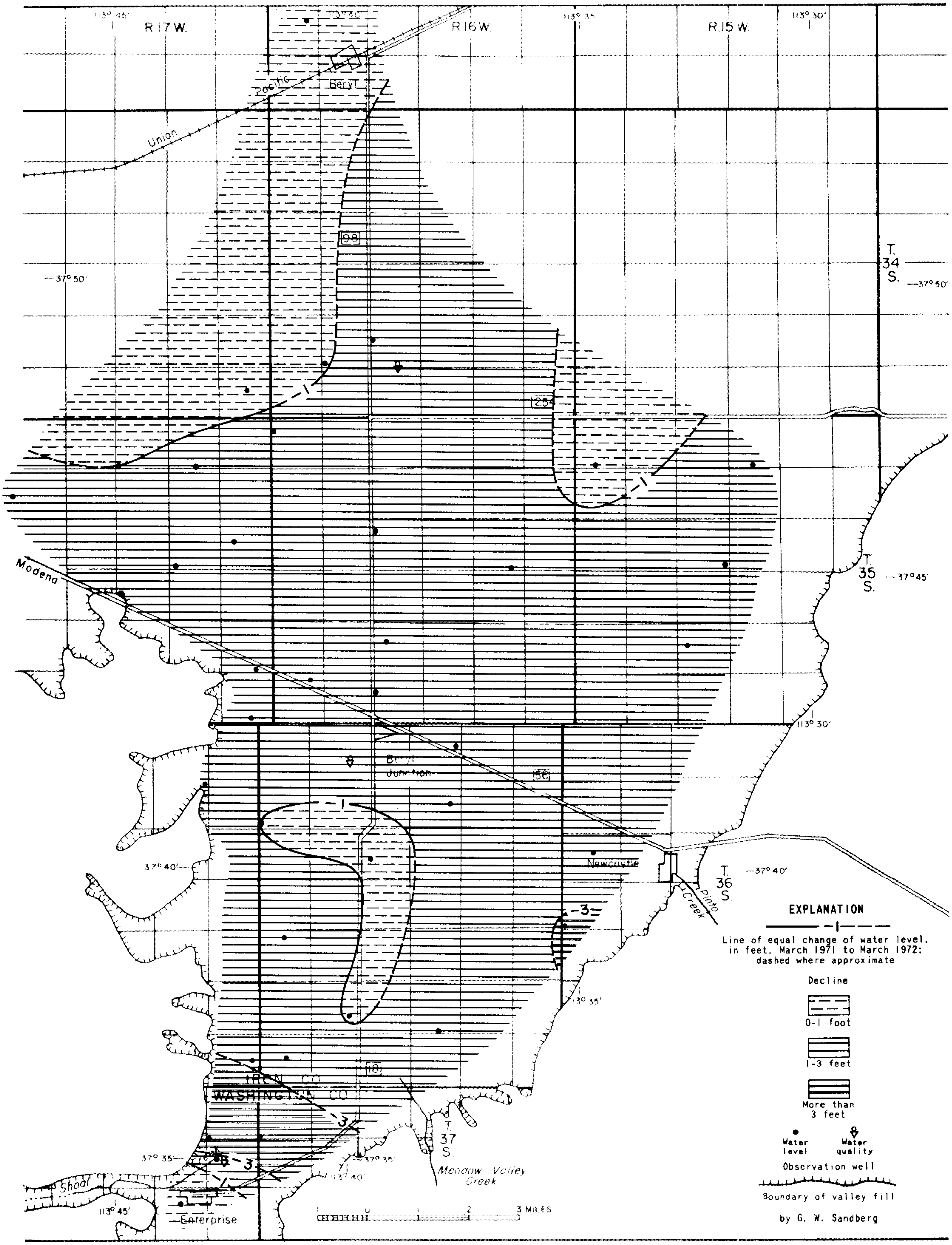


Figure 34.—Map of the Beryl-Enterprise district, Escalante Valley, showing change of water levels from March 1971 to March 1972.

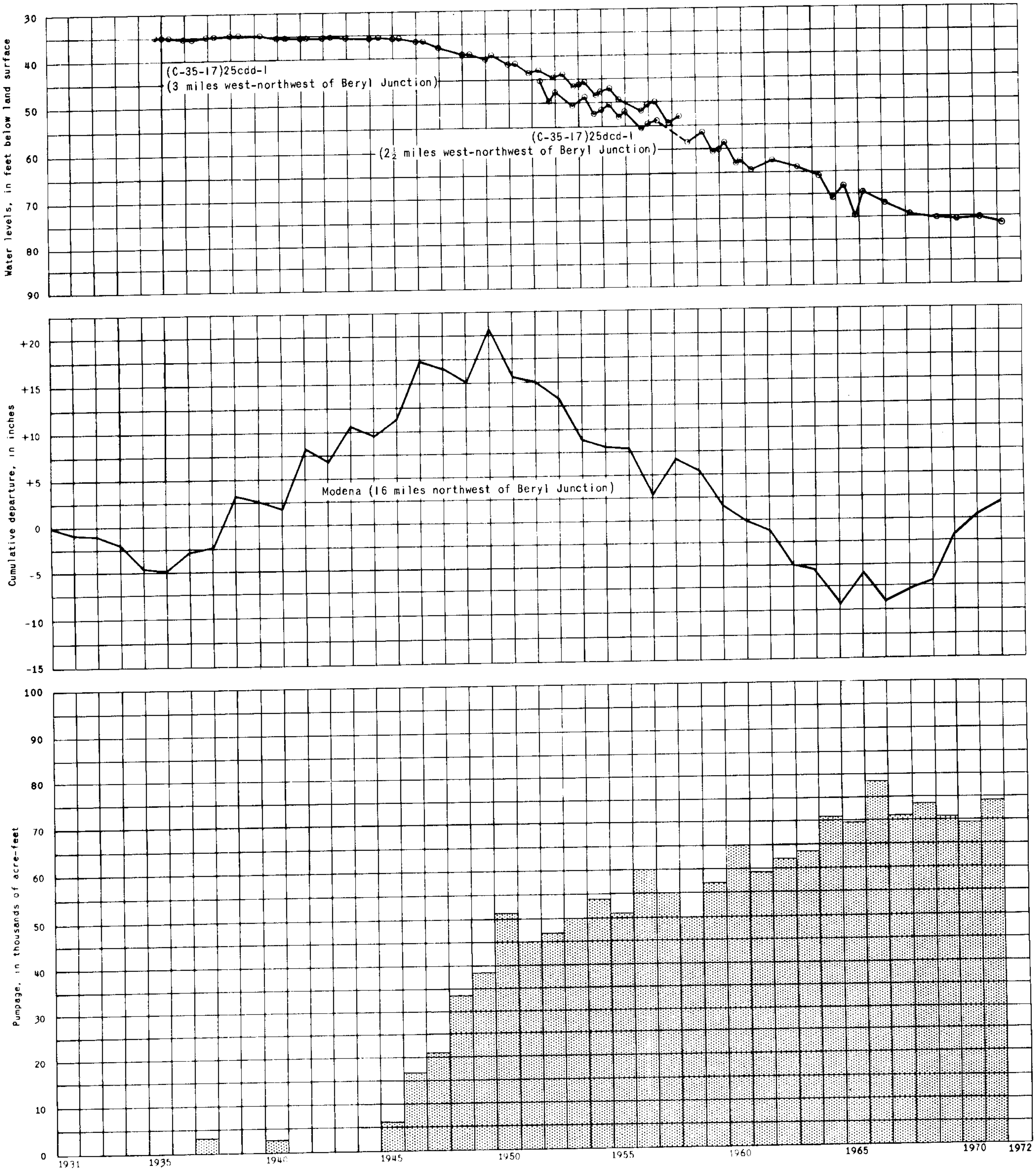


Figure 35.—Relation of water levels in selected wells to cumulative departure from the 1931-60 normal annual precipitation at Modena and to pumpage for irrigation in the Beryl-Enterprise district, Escalante Valley.

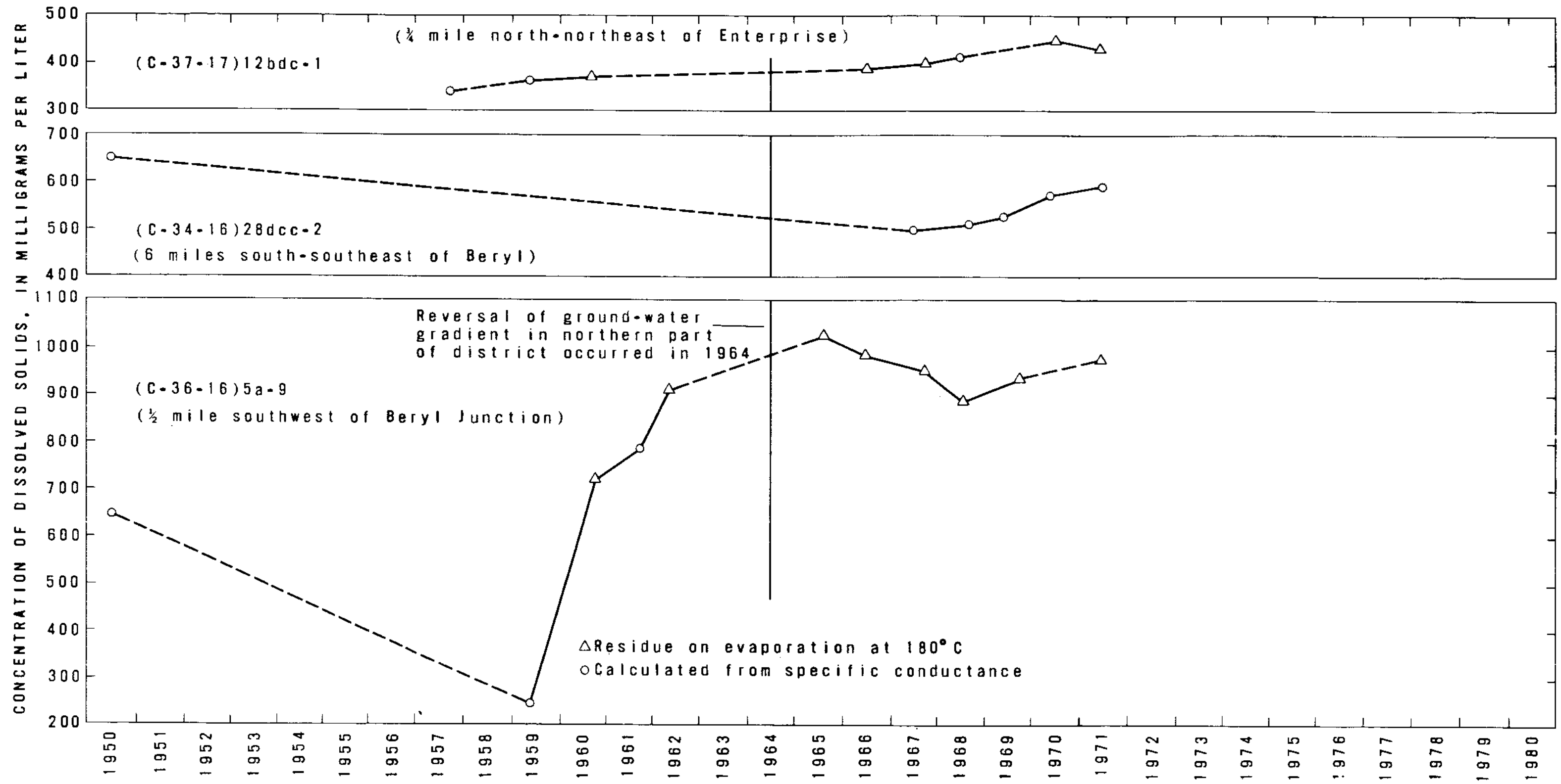


Figure 36.— Concentration of dissolved solids in water from selected wells in the Beryl-Enterprise district, Escalante Valley.

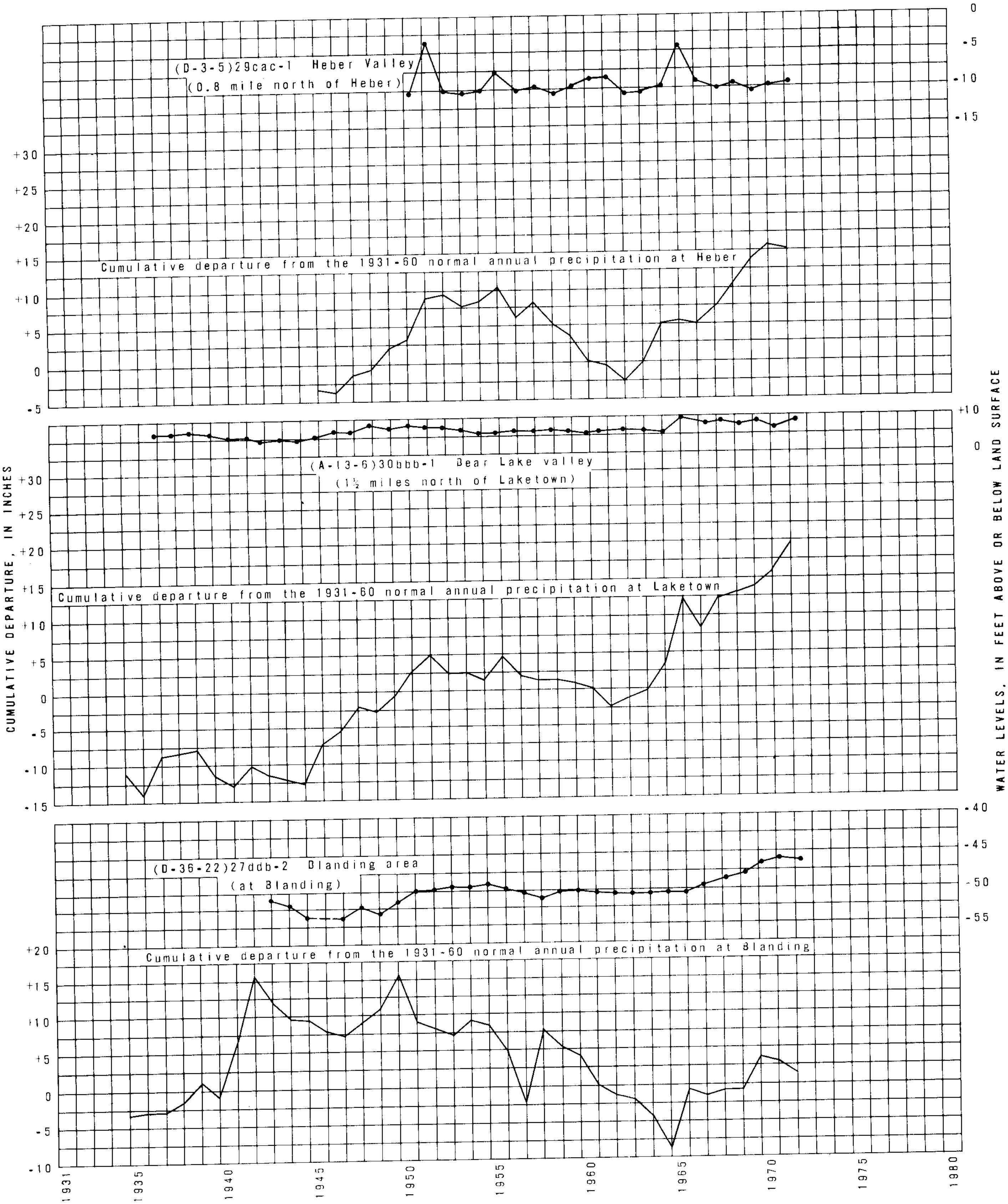
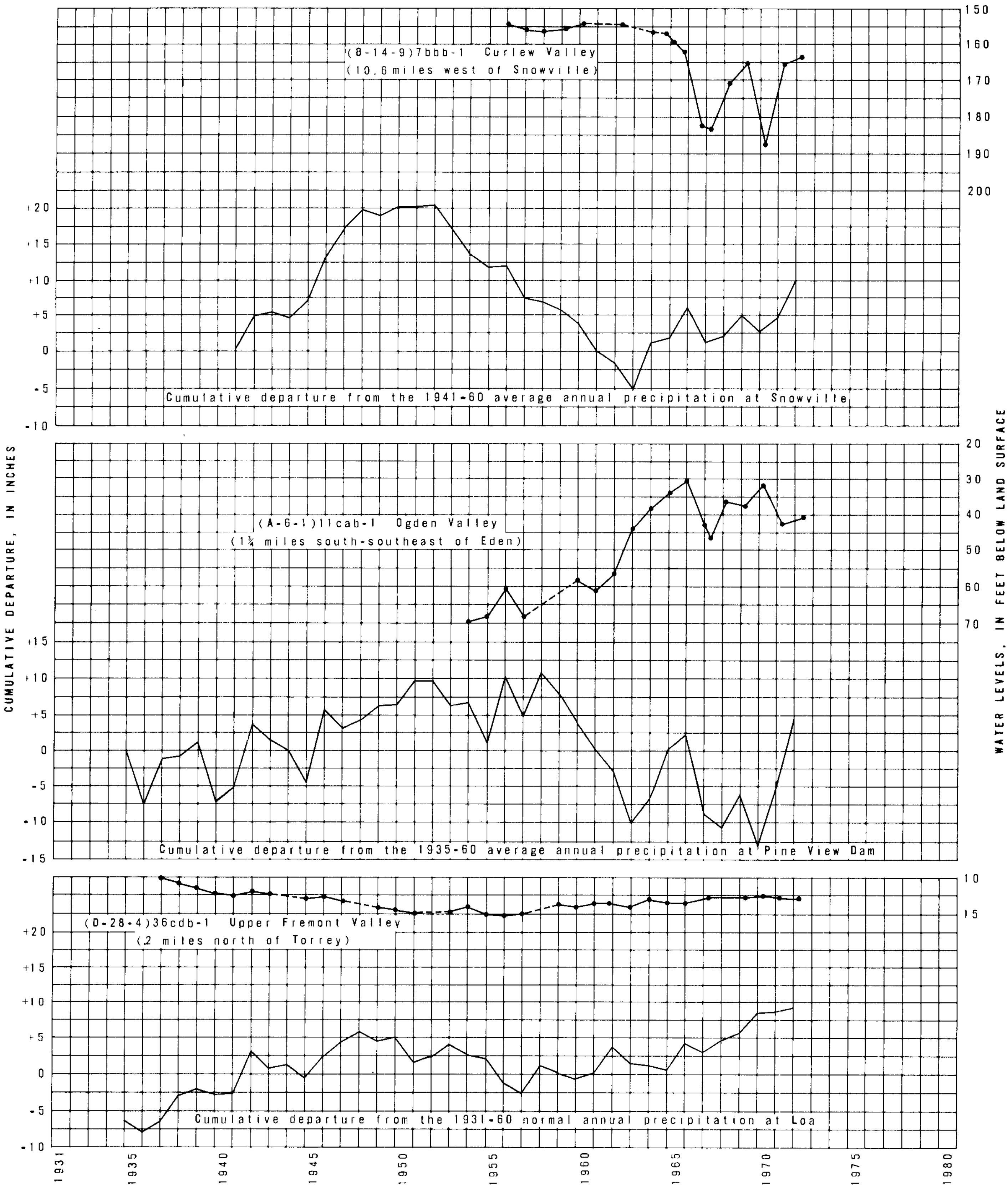


Figure 37.—Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas.



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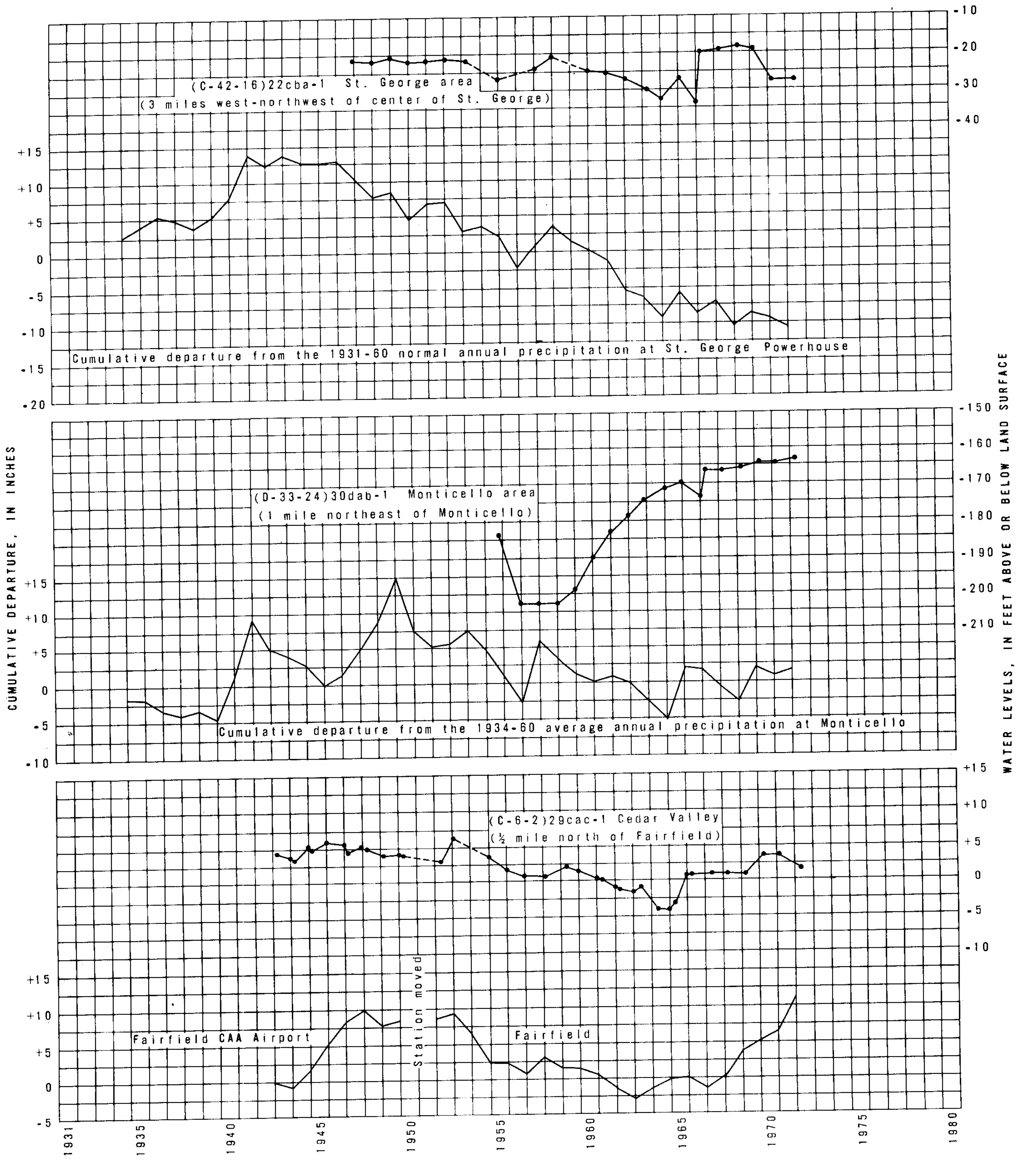

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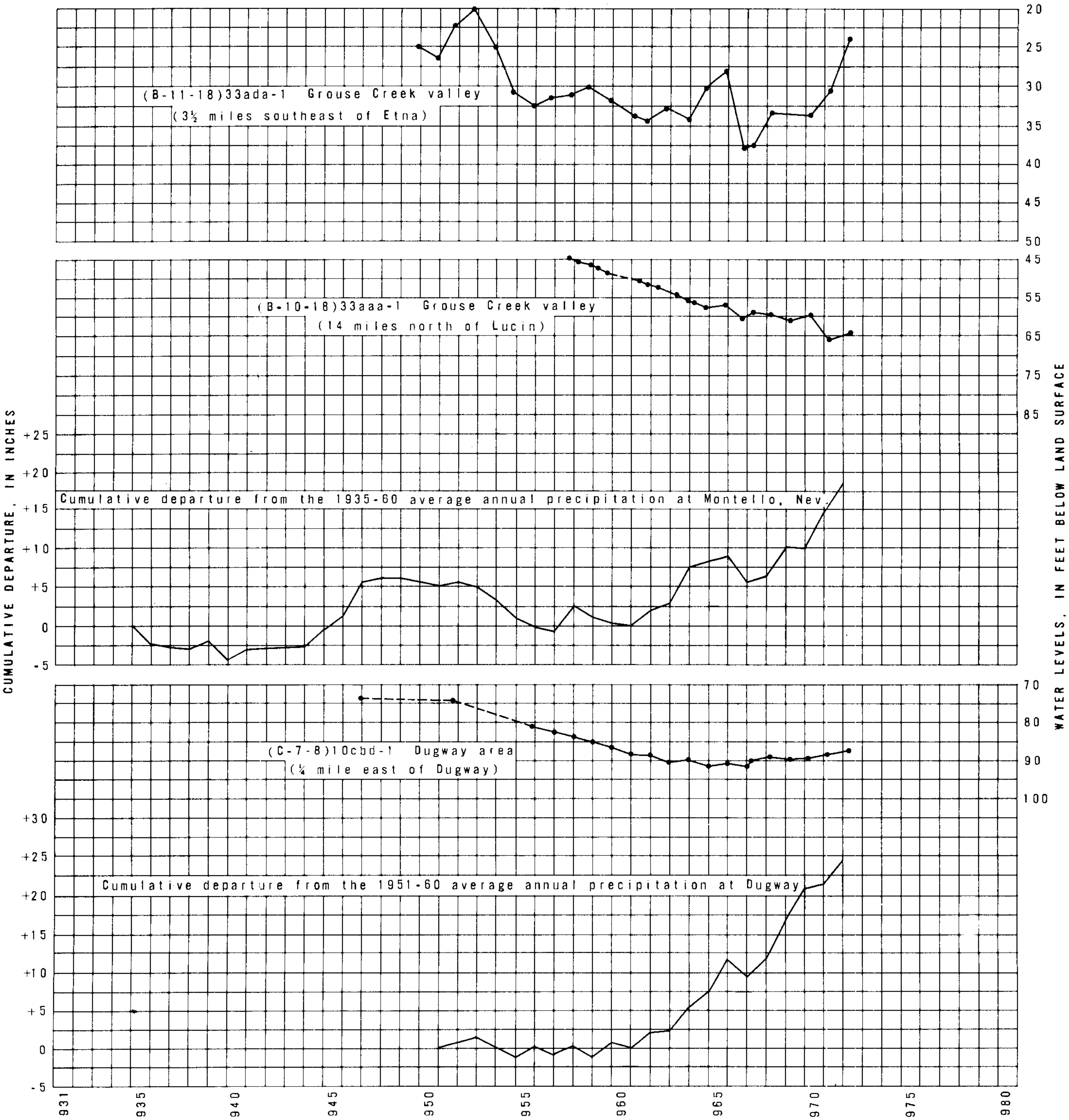

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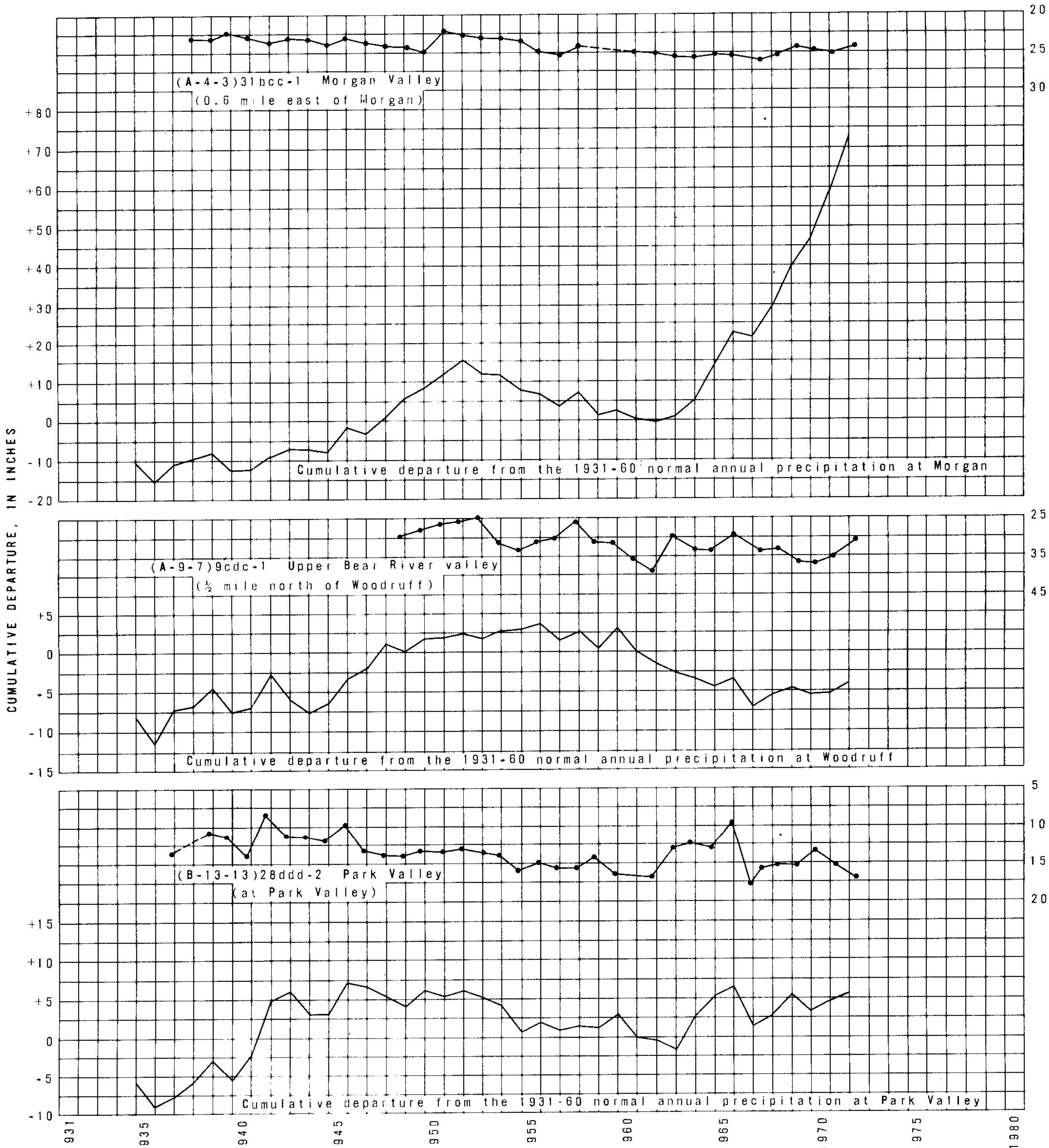

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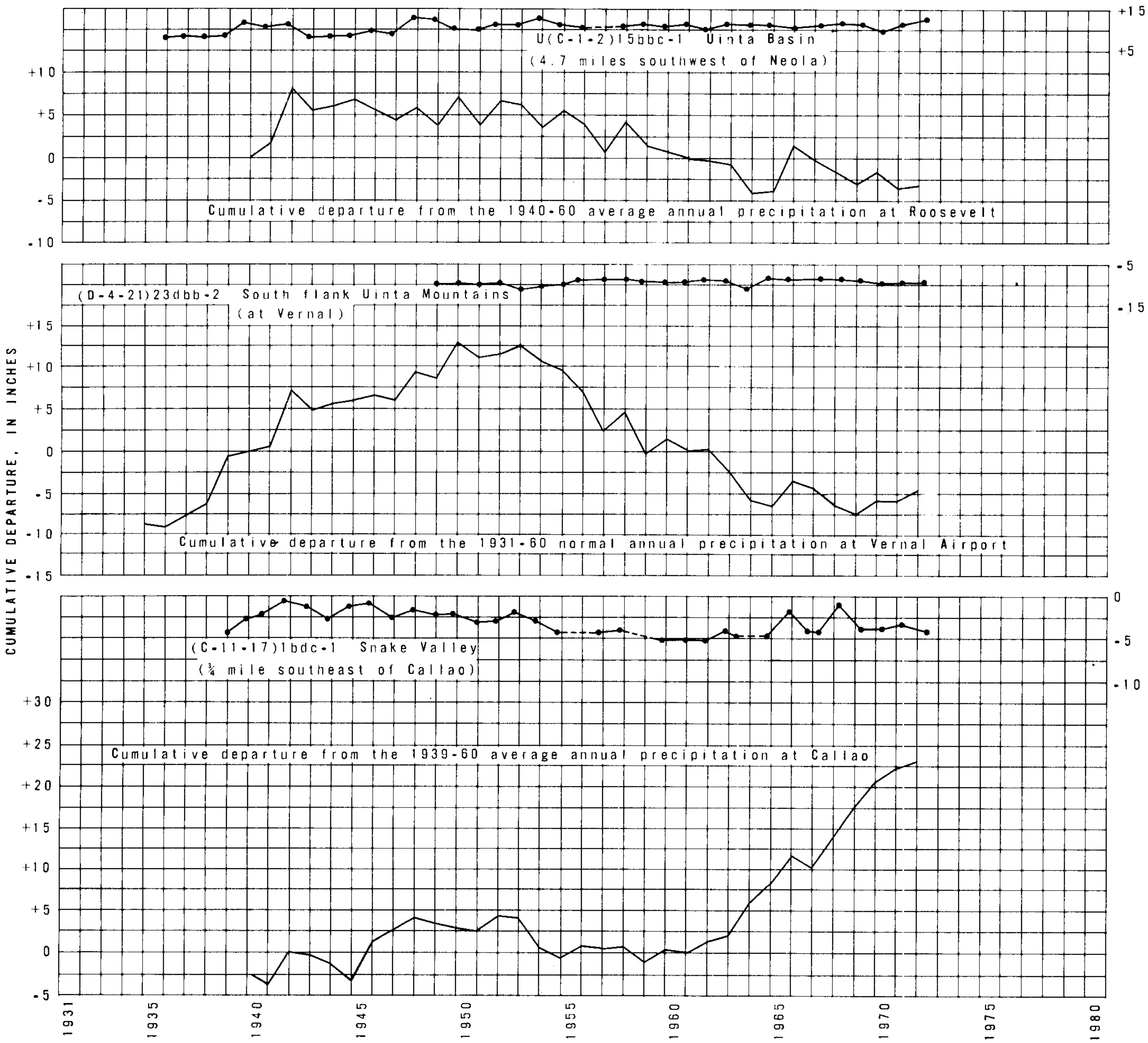

Figure 37.—Continued.

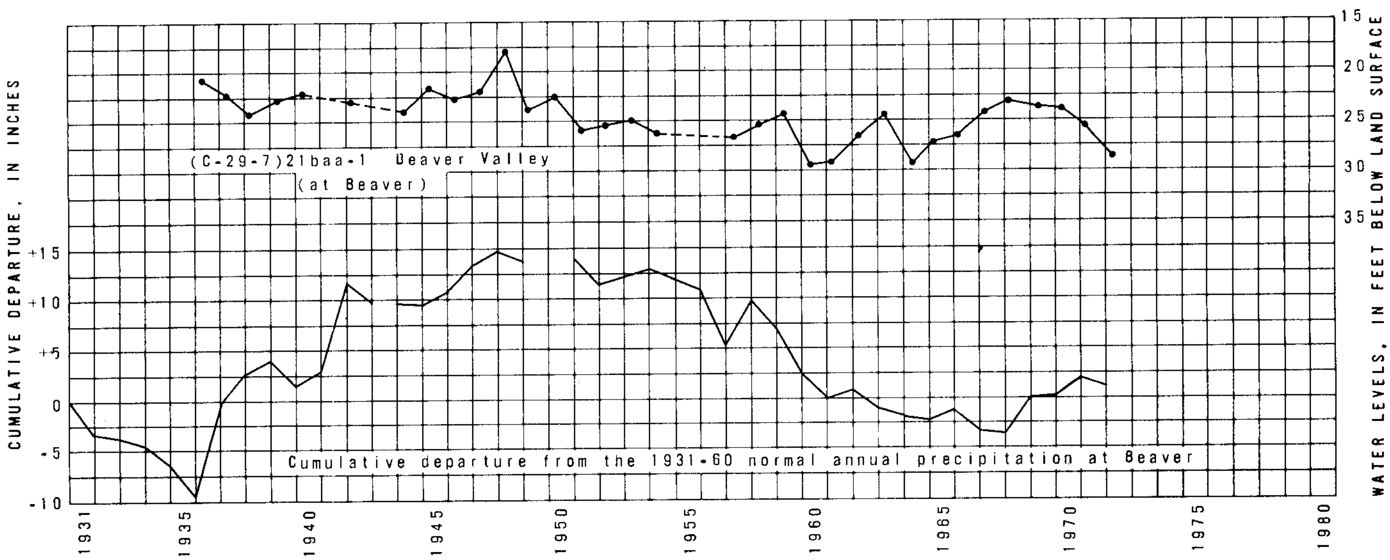

Figure 37.—Continued.